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Questions of the Hour

WE welcome the interest which correspondents and contributors continue to take in our recent editorial comments upon a number of matters which we consider of vital importance to the industry.

It is our desire that readers should express themselves with the most perfect freedom. It is not pleasing to hear the same voices again and again in public; often the men who sit silent are thinking independently and furiously, but they are content to contribute their ideas subsequently in conversation, and only a few people have the benefit of them.

Views expressed in our "Correspondence" pages find a larger audience than is afforded by all the institution and association meetings put together, and ideas recorded in print there by a perhaps quite unknown thinker may influence many minds at home and abroad and set them at work in new directions, changing the outlook and leading to a revision of methods.

There is, however, the possibility that when many matters come forward simultaneously slight confusion may arise, and the discussion of subjects may merge and become somewhat involved. For example, our appeal for a canvass of non-electrical or partly electrical consumers from one end of the country to the other, for boosting the domestic and the industrial loads, has become mixed up with the suggestion that the electrical industrial personnel has no organisation to voice its views, and to afford it suitable facilities for representing its interests.

The confusion proceeds a step further this week, when a writer condemns any idea of the Institution of Electrical Engineers ever sinking so low as to concern itself with commercial affairs—forgetting, presumably, the very keen discussion that took place within the Institution ranks years ago, and oblivious of the fact that the Institution found it to be not only good policy, but its actual duty, to protest against reparations in kind when our power station and electric traction industry was threatened.

It has devoted various meetings to some of the commercial and general aspects of electricity supply development, but while, in our opinion, the day is long past when the Institution could wisely be regarded as superior to industrial affairs, we fail to see how by any stretch of the imagination it can be regarded as the proper body to take part in a national canvass.

Many who have to do with such work are in no way interested in, or subject to, the Institution. There are others besides technical men who count materially already, and must do so more in the future, in furthering the commercial interests of the electricity supply industry.

We feel drawn to repeat that the commercial men of standing in the industry have no organisation of their own; there was once, and we believe still is, an Electricity Supply Commercial Association, and there is also an Electrical Commercial Travellers' Association, but these do not meet the case that we have in mind, and it is obvious, from some of our Correspondence, that the want exists for a platform whereon the large questions of the industry can be publicly discussed.

The question of how and by whom a national or any other canvass should be made is being ventilated by experienced contributors. It is surely for the Central

Board and the electricity supply authorities themselves to take action. The part to be played by E.D.A. or the I.M.E.A., or a company group, or any other body, is for the industry to settle. We believe that both of the bodies named should urge their members and supporters to get busy, if they have not already begun, but the actual work of the individual electricity supply authority cannot be done by any kind of association.

Strengthen E.D.A.

No new association is needed for such purposes; what is required is that all sections of the industry should so strengthen E.D.A. as to enable it to occupy the highest and most powerful position. E.D.A. is reputed to include all organisations interested in electrical development; under its friendly roof all should gather to pursue one common end—progress! If these things were so in actual fact, its financial strength would add vastly to its power. It could do many things that it cannot do now. Important interests prefer to go "on their own" and remain outside; on the other hand, there may be insiders whose zeal for individual interests prevents a united policy being followed up by strong action. Its recent praiseworthy effort to bring the electricity supply sales managers together was more or less of a failure. Unfortunately, the meeting was private, and only a sort of "official" report was circulated to the Press, whereas the importance of the subject and the possibilities of such an assembly were such that the Press should have been invited. However strong E.D.A. may appear when judged by its output of publicity matter, it will be quite mistaken if it adopts a weak Press line with reference to its own operations.

An Urgent Suggestion

WISE economy is desirable—economy which restricts profit-earning employment is false economy and utter folly. If the I.E.E., the I.M.E.A., and the E.C.A. were to hold one joint convention next summer, instead of three separate ones, a number of conventionists would be saved time, money, and energy. They would not have to make three breaks away from their businesses—they would be able to spend more time keeping what a popular novelist has called the unrecorded commandment: "Mind your own business!" In addition to all this economy, there would be the inestimable advantage accruing to the whole industry from the holding of one big Electrical Convention. Its desirability has often been urged. It will come sooner or later. What a fine thing it would be to get together and face electrical responsibilities and privileges! Is it too late to think about it for 1932? Why not a preliminary meeting of the three presidents straightaway?

Electrical Refrigerators

WE cannot share with Lord Burnham the surprise that he expresses in a letter to us that provision for the installation of a refrigerator in every new house is not insisted upon. We want fewer, not more, restrictions placed upon our individual freedom in the home. We are anxious that electrical refrigerators should be used far more extensively in shops and in private houses, and we believe that there will be a bigger market in them soon. We are a long, long way behind in this. Power points would facilitate their introduction, but Lord Burnham has not come to close quarters with the small new house problems, as have hundreds of thousands of people. The trouble in many places is to find floor or other space for some of the essentials that exist in older houses. The use of electric cooking and water-heating economises space. Occupants of houses, new and old, large enough to spare accommodation for electrical refrigerators have an opportunity denied to the myriad of new small bungalow dwellers. Pure food is extremely important, and if we use an electrical refrigerator we may go a long way toward guaranteeing it. It would be a great gain if we could secure the co-operation of housing committees, architects and builders in installing plenty of lighting and power points. If Lord Burnham can help to bring that about we shall be "with him all the time."

Living Abroad

ONCE again a correspondent asks for information regarding living conditions in an overseas country—this time British Guiana. The changing times make it almost impossible to keep information of this sort up to date, but no doubt the Department of Overseas Trade, the Colonial Department, the Dominion High Commissioners and the embassies and legations of foreign countries are able to give some idea of the cost and methods of living in their respective parts of the world. All the same first-hand non-official information is probably of greater value, and we publish such queries as this from time to time in the hope that readers with actual experience in these countries will come to the inquirers' assistance.

Improved X-ray Apparatus

DURING the past five years there has been a material improvement in the design of X-ray plant, and British radiological industry is now well to the fore. What is now needed is a greater demand. Last week's Radiological Congress and Exhibition showed progress and development to be continuing along sound engineering lines. Most British manufacturers now make their transformers comply with the appropriate British Standard Specification, and Government departments specify such components; but are private practitioners sufficiently aware of the B.S.I.'s work? Ratings, relative to the actual output at the X-ray tube, might be placed on a firmer basis. There is a general tendency to separate plant used for radiology and therapy though in the case of the smaller installations a single outfit still serves both purposes.

Safety Assured

WOOD cabinets are giving place to earthed metal cages into which the whole of the electrical equipment is put, with low-voltage remote control. The plant now bears a striking resemblance to a small works sub-station. The metal screening couches are capable of being earthed—another step towards the shock-proof ideal. X-ray protection has long been a feature of British-made equipment. To-day, transformers are employed which are often energised from the supply mains, so that electrical protection has become a necessity.

Diesel-electric Locomotives

WE include this week an article stating the case for the Diesel-electric locomotive. With the comparison made with non-electric systems of transport we have every sympathy, but we believe there is a better way of "doing it electrically" than that advocated by the author. Our own view has been expressed often enough in these columns. It is that main-line electrification can be dealt with much more effectively by generating the electricity required in large modern power stations interconnected by the Grid, but that spare lines with low traffic density may often present a Diesel-electric opportunity.

Our Suburban Railways

THE observations of the railway companies on the recommendations of the Royal Commission on Transport are not inspiring. Road transport is a formidable enough rival, but surely there is no good ground for the confession of inferiority implied in the attitude of the railway companies on suburban-line electrification. Their view seems to be that expenditure incurred in enabling their services to compete with road vehicles may be fruitless, so that it will be better to wait and see how much more traffic can be taken from them before they take action. The experience of the Southern Railway that improved facilities lead to increased revenue has failed to convert the pessimists.

Current Radiological Practice.

By E. H. W. Banner, M.Sc., A.M.I.E.E.

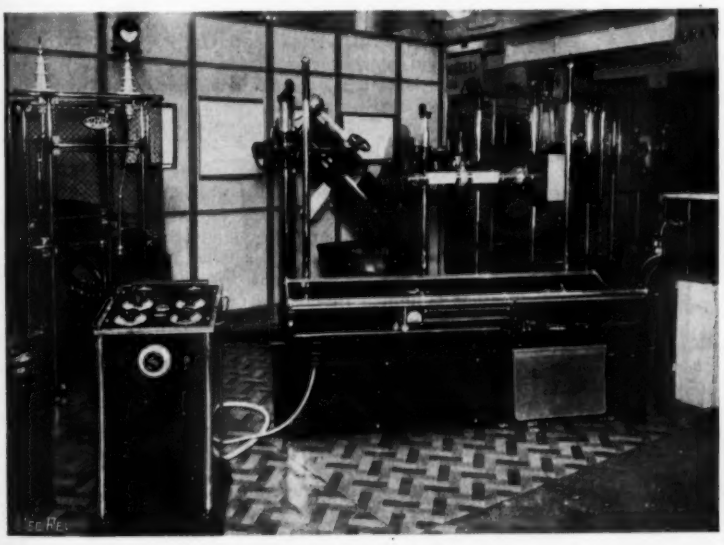
A survey of apparatus shown at last week's exhibition

ONE of the things that impressed me at the Exhibition organised by the British Institute of Radiology at the Central Hall, Westminster, last week was the general provision made in apparatus to afford protection from high-voltage conductors.

The standard of improvement and development along sound engineering lines is continuing. Another tendency is in the design of separate plants for radiography and therapy instead of combining the two in one plant, a scheme which is still in demand for small X-ray departments. Practically all the British firms make transformers to the appropriate British Standard Specification.

Whereas originally the power plant consisted of odd items of apparatus mounted adjacent to or in a wooden cabinet with all sorts of stray fittings, now it is usual to see such a plant built as a complete unit; frequently all the gear is mounted on the transformer tank in small sets, and in larger plants each item is designed to fit into the general scheme and is enclosed by a metal cabinet of solid or grid form.

Whilst the development of very high voltage X-ray tubes is taking place it is unlikely to influence the design of plants for surgical and medical radiography, although such high-voltage tubes have important applications in industry and perhaps in therapy and crystal analysis. Relatively small sets, such as those for dental work, usually operate without a separate rectifier, the tube itself being sufficient; portable or trolley sets are also often of this type to secure simplicity and a reduction of weight and cost.



Single-valve equipment, showing earthed metal cage

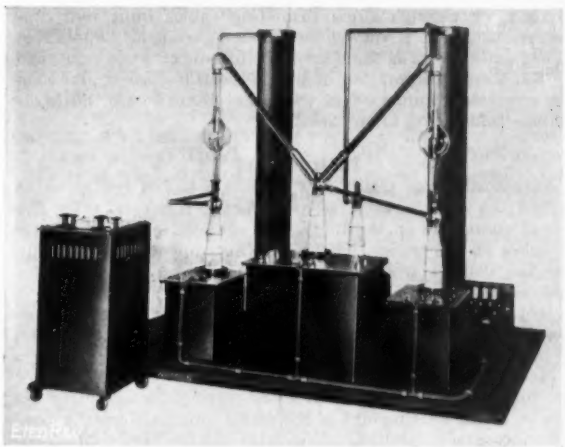
The most usual apparatus for radiography is the one-valve plant in which some form of valve, or thermionic rectifier, acts to produce a half-wave through the tube. Next in general order of importance is the four-valve plant in which a full-wave supply is produced at slightly less than transformer voltage. The proportions of these vary, in general the one-valve set sales exceed those of the four-valve by about 200 per cent., although one firm deals mainly with the four-valve plant.

An alternative means of obtaining a full-wave supply, by using two valves, is not in any demand. It produces a supply at only half transformer voltage, as against full voltage for the one- and four-valve sets. Next is the six-valve set, and this is confined to three-phase supplies. It is unusual except in the largest installations, but it has the advantage to the supply authority of providing a nearly balanced three-phase load.

Mechanical rectifiers are now made only to a very limited extent. The use of condensers is increasing, generally in two distinct forms, for smoothing rectified supplies to approximate to a pure direct current and as a means of voltage doubling in a scheme of connections due to Villard.

Dual-purpose Equipment

In small X-ray departments where the work is very limited it is often of value to have a dual-purpose plant, and a design generally similar to that introduced by Mr. W. E. Schall a year ago is now fairly usual. This comprises a single-valve plant at transformer voltage for radiography and a Villard circuit using two condensers providing twice transformer voltage for therapy, each being obtained simply by the operation of a switch in the high-voltage leads.



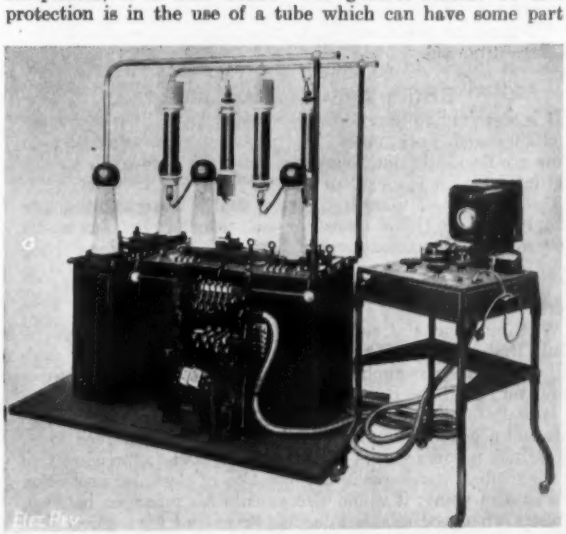
Large condenser plant for therapy

With this exception, it is now usual to separate the two functions with the idea that a room should definitely be allocated to therapy instead of fitting in treatment with the usual intermittent diagnosis work. With this end in view it is simple to produce one set for radiography and another at double voltage and reduced current for therapy practically from the same component apparatus, the only real alteration being in the provision of condensers in the latter case. This leads to an improvement in production.

Another feature introduced a year or two ago is now quite general—dual control for radiography and screening, so that a given current and voltage can be pre-set for each independently; the actual change-over is done by a small switch or press-key.

X-ray protection has long been a feature of British apparatus; in fact, some manufacturers consider it overdone, as cheap Continental apparatus may score on price through not providing the degree of protection recommended. Electrical protection has in general been considered to a far less extent, mainly due to the fact that the purchaser, usually a medical man, has not asked for it, whereas he is aware of the dangers due to the rays.

To some extent this is explained by the fact that originally sets using induction coils with open cores rarely produced more than an unpleasant shock; now that efficient transformers are universal, often fed from the mains, such shocks are capable of being fatal. Whereas a few years ago this was exceptional, it is now usual. The general scheme of this protection is in the use of a tube which can have some part



Four-valve set showing contactors

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of it earthed and the live parts, usually the two ends, well encased in insulation.

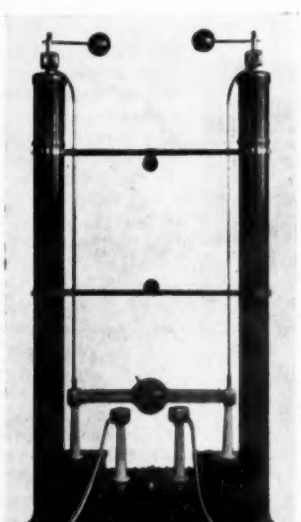
The high-voltage current is fed to the tube either through concentric flexible metallic cable, the outside of which is earthed, or through thick insulating cables built like condenser bushings. A very sound scheme particularly applicable to low-power work is the dental set introduced some years ago by the Victor Corporation in which the transformer and tube are completely immersed in the same oil-filled case, no high-voltage leads being brought out.

Instruments

Almost all X-ray plants now include a trolley control table embodying dual controls, as mentioned before, and often the use of contactors on the main gear operated by small control switches on the trolley. Measuring instruments are generally on the control trolley also, again coming into line with engineering practice by inserting instruments at or near earth potential on the control board, although the large milliammeter in the high voltage circuit on top of the plant is likely to persist for some time.

Measuring instruments include a moving coil milliammeter for tube current, which with a self-rectified or one-valve set can be at the centre-point of the transformer, electrically, and therefore easily earthed. Four-valve sets do not lend themselves well to this as the transformer current is alternating, due to the alternate use of the rectifier pairs to produce an unidirectional current.

Some makers are considering the use of moving-iron instruments for the purpose, a rectifier instrument having the disadvantage of its inherent wave-form error. An alternative is in the use of a current transformer insulated for half the working voltage, so that again the instrument may be earthed and on the control table adjacent to its control switches. The high voltage is usually indicated by a voltmeter in the transformer primary calibrated in secondary volts on load. As the regulation of the overall set, including the rectifier drop, is only a few per cent., very little error results from this course.



Condenser plant for 180 kV

The use of spark gaps is almost obsolete, although some firms fit a point-point gap as standard practice to satisfy the customer who "likes to see something spark." Sphere gaps are occasionally used, mainly as a fixed gap to limit over-voltage of the transformer, sparking-over resulting in blowing the main fuses. Other instruments include a filament voltmeter, or ammeter, or, alternatively, a voltmeter across the primary of the filament transformers, so that again all readings may be made from the control board.

British Apparatus Advancing

It is encouraging to note the increasing use of British instruments for such work, most of them being first grade, although some are decidedly not, being evidently made down to a price and intended for less exalted jobs.

The majority of manufacturers make their transformers to comply with the B.S.S. issued for such transformers, but whilst Government departments specify this it is unusual for private practitioners to do so, owing to their absence of knowledge of the existence of the British Standards Institution and its work.

With more general recognition of this specification it is likely that others would be equally valuable, particularly dealing with ratings as applied to actual output at the X-ray tube. However, until the demand appears from the purchasing end it is doubtful if further specifications would be justified. To this end a general circular issued as a guide and agreed to by all British manufacturers would probably assist; the education of the medical purchaser in the direction of electrical protection is a case in point; it would also explain discrepancies between tenders when one relates to a definite output for a given time and another which actually gives only half that output, although the voltage and current quoted may be the same.

Tubes and Rectifiers

Three items of apparatus which are not always British-made are X-ray tubes, valve rectifiers, and condensers. Of the first the gas tube is obsolete, the Coolidge tube is used to a limited extent in this country, although a new envelope or shield of lead glass renders it quite small and yet ray-proof. The "Metalix" tube has been general for some years and, having its own X-ray protection, it is a most useful instrument.

The "Protexray" tube made in this country by Cuthbert Andrews is increasing in sales. It is at present limited to small sizes, suitable for general radiography, but there is a larger and newer model for therapy, a water-cooled tube operating at 4 mA, 130 kV continuously; still larger sizes of tubes for deep therapy are in progress of design and manufacture. With the exception, therefore, of very heavy current tubes there is a British-made tube available for every purpose and in increasing use. Another recent British-made self-protected tube is that of C. G. Aimer; Muller tubes are also used to some extent in this country.

Thermionic rectifiers are made in this country by the General Electric Co., Ltd., and Messrs. Newton & Wright. Both makes are plain glass valves, whereas Philips Lamps, Ltd., make a valve somewhat similar to their "Metalix" tube, embodying a hollow metal hood as the anode. Here also the British article is being used to an increasing extent. "Osram" rectifiers are now made for 220-kV circuits, ample for even very large therapy plants as well as for industrial uses such as cable-testing, &c. Some valves due to foreign firms are now being produced in this country.

Condensers suitable for the order of 100 kV are not a normal engineering requirement, with the result that at the present time most of the condensers used for the Villard circuit for smoothing are made abroad. A British firm has the matter well in hand, and it is unlikely that such condensers need be considered as one of the components essentially to be purchased abroad in the near future. These condensers are usually made of paper and enclosed in a Bakelite or bakelised paper cylinder, often themselves acting as insulating supports for other gear.

Controls

In connection with controls the general tendency is towards selector switches on the transformer with contactors. Some sets operate with contactors for each tapping, a necessity for dealing with large plants and again directly in line with modern practice. This leads to a smaller number of ranges of voltage, but six are sufficient for most work. It is probable that a limited number is even an advantage, as it tends to standardise exposures to given values of voltage.

Whereas the general scheme is a tapped primary, the Solus Co., employs a tapped secondary thereby running the primary under constant conditions for a given load. Relays are used to operate the tappings, the small d.c. relays being energised through a selector switch on the control trolley from a local d.c. supply obtained from a metal rectifier incorporated in the set.

Although these tappings are limited to six, three other tappings on the primary, but covering individually a much narrower range, provide for eighteen variations with nearly constant primary conditions, thereby giving all the voltage range that can be required.

Some Individual Exhibits

Most of the X-ray and electro-medical apparatus makers were represented in the Exhibition, including one each from America, Holland, and Germany. X-ray apparatus was predominant, but among other equipment there were many diathermy sets. The spark generator is commonest, but valve generators, first introduced by Philip Creswick two years ago, are also making headway.

Due to the tendency towards standardisation, the foregoing general descriptive matter covers most of the exhibits, and the following details are intended to amplify this information. A large single-phase two-valve and condenser set due to Watson & Sons (Electro-Medical), Ltd., was shown. This is a combined set suitable for diagnosis and therapy. "Osram" 220-kV valves are used, and the usual dual-control trolley is found. A large shock-proof couch and tube stand are typical of the present-day tendency, the couch is mainly of metal which can be earthed and all high-voltage points are inaccessible. A small trolley-mounted set for ward use is also typical of its class; it supplies 10 mA at 90 kV peak. Again, as is usual with this type of set, no separate rectifier is fitted.

A proportion of this firm's output are six-valve sets, one of which was shown last year, but the majority are one-valve sets with a quantity of four-valve plants. A wood cabinet houses a therapy plant capable of 20 mA at 150 kV peak. "Osram" rectifiers and Muller tubes are usual.

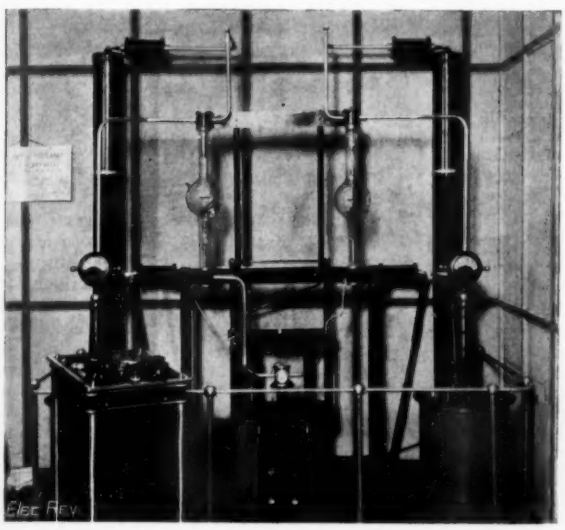
One form of electrically protected one-valve plant was displayed on the stand of W. E. Schall & Son. The whole of the electrical gear is built inside an earthed metal cage with

low-voltage control leads passing out to the control trolley, equipped with the dual control initiated by this firm some years ago.

One-valve sets predominate in favour, with four-valve sets second in importance. Another new set is one capable of being used as a two-valve full-wave set giving 400 mA at 75 kV peak for radiography, half-wave with one valve giving 30 mA at 150 kV peak for therapy, or one-valve half-wave for 100 mA at 100 kV peak for radiography requiring less power. Various makes of rectifiers are used.

New patterns of couch, although of no obvious engineering interest, are to be noted for their solid construction of metal capable of being earthed. A new heavy-output diathermy set for surgical use was demonstrated.

The usual method of voltage-change is now by means of tapping the transformer primary, but one exhibitor showed a four-valve set with secondary tappings. The advantages



Equipment for deep therapy and radiography

of this have already been explained. Another set for therapy is a Villard circuit for running up to 12 mA at 300 kV. Voltage is controlled finely by an induction regulator from the control table and the set is arranged to supply two tubes in parallel for simultaneous use. The rectifiers used in this set are "Metalix," using two rated at 160 kV in series. A couch shown was designed only a few days prior to the Exhibition, and includes an electrically run Bucky grid and a screen attached to the couch and held in gimbals for universal motion.

Another notable exhibit was a Villard valve and condenser circuit made up into a compact therapy plant for use up to 180 kV. It was by Newton & Wright, and other gear shown by this company included one-valve sets, a trolley set for ward use, and an all-metal couch capable of easy manipulation. Rectifiers are of the firm's own manufacture, and "Protexray" or "Metalix" tubes are usual.

Sphere gaps are fitted to many sets, but in all instances the gap is fixed and intended only as a preventative against transformer damage due to over-voltage. Mechanical rectifiers are still made, but to a decreasing extent.

X-Rays, Ltd., showed a large plant for deep therapy which is equipped with a quick-change to radiography without the Villard condensers. For therapy it will deliver 5 mA at 230 kV and 100 mA at 125 kV for radiography. A large couch gear allows for six-foot technique from above the couch. The "Protexray" tube is used throughout and the rectifiers are also British—Newton & Wright's. Self-rectified, one- and four-valve sets are made, and mechanical rectifier sets are also produced in small numbers.

A. E. Dean showed a large plant built for a particular hospital where the plant is to be in a separate room from the couch. The generating apparatus includes a Villard circuit and glass rectifiers. The tube is a large Philips deep-therapy water-cooled one, the plant rating being 12 mA at 250 kV. Other sets included a four-valve set as shown before, contained in a wooden cabinet and still using a point-point spark gap, in common with some other gear on the stand. This set includes Philips glass rectifiers and is rated at 250 mA at 100 kV peak. A Philips "Metalix" valve is standard. In addition, self-rectified trolley and dental sets were on view.

The "Autogram," as shown last year, was the principal exhibit of Stanley Cox; it is essentially a small and light plant capable of use where an elaborate set is out of the question. The transformer is in the base of the tube stand and a "Metalix" or other self-protected tube is carried direct, no rectifier being used. It can be supplied mounted on a trolley for ward use and will deal with cases requiring up to 30 mA at 90 kV peak.

The two British X-ray tubes, the "Protexray" of Cuthbert Andrews and the "Welbec" of G. C. Aimer, have already been dealt with in the general description. Each is fully protected against stray radiation, and both makes are being sold in increasing numbers, although the latter is a very recent addition on the market.

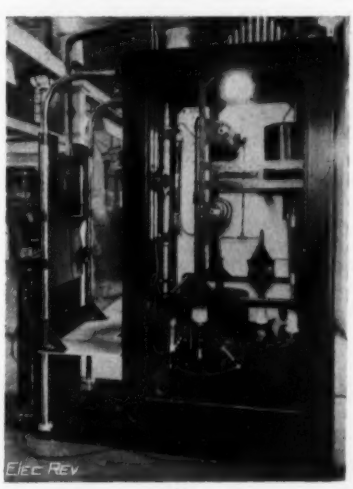
Of the foreign firms showing, Philips Lamps had a good display of "Metalix" and other tubes and valves. Apparatus included a large 180-kV set for therapy. The tube is completely encased in insulating material, and the leads at each end are shock-proof also, leading to a very good heavy construction proof against shock and unwanted radiation. For smaller tubes a somewhat similar envelope has been designed in which the leads are taken away from the tube from the back; the tube may be brought very close to the patient if required. The envelope is of lead-loaded porcelain.

Small self-contained dental outfits were shown, and a large set typical of one trend of design comprises a metal cabinet containing, in addition to the generating plant, the tube itself, the rays passing through a window in front of the apparatus where a vertical screening stand is attached. This is essentially shock-proof without special tube or leads.

The General Radiological and Surgical Apparatus Co. exhibited a number of its standard sets, including the "Heliodor" one-valve set. New apparatus included a couch and overhead gear for six-foot technique, and here also were shock-proof sets embodying envelopes to the tubes and high-voltage cable. The "Multix" tube is made in various forms, some of which were described in a paper read before the annual congress of the B.I.R. during the meeting. Siemens glass rectifiers are usual with this gear.

The Victor Corporation, allied to the American General Electric Co., is now making a valve set, although it still recommends and makes mechanical rectifiers for sets up to about 400 mA. A four-valve plant for 1 A at 85 kV peak, or 500 mA at 100 kV peak, was the first one of its make exhibited here. Controls for voltage are by auto-transformer tappings, and it is claimed that provided the line voltage is maintained constant the tube voltage and current can also be maintained constant by setting the two selectors to the values required—voltage and current.

This firm's dental outfit was probably the first to incorporate complete shock-proof features, and instituted a new line of design. Coolidge tubes are commonly supplied, and a small lead glass cover renders the tube ray-proof with little added bulk. "Protexray" tubes are also supplied with some sets, and some of the Corporation's apparatus is now made in this country.



Diagnostic outfit with rotating-anode tube

Congress Papers

Papers were read at the meeting, including one by Dr. G. Grossman on advances in high-voltage design. He dealt with shock-proof double-wall tubes and the "Supra" valve working at 450 kV peak. An anode is constructed of copper with both an axial and a right-angle hole to the centre, where the target is placed. Cathode rays enter the screened axial aperture and the rays emerge from the other opening and are directed away through the wall. The "Supra Multivolt" is a large plant with condensers for 550 kV peak, the filaments of the rectifiers being supplied by d.c. generators driven through long insulating shafts.

Another paper by Dr. A. Bouwers dealt with economy in radiology, and gave evidence in support of lower ratings than are considered necessary. In a particular case he considered that a 4-kW tube was the optimum value as regards results, and also showed that for this example 0.06 sec. was the best exposure and that this could simply be obtained by a condenser discharge, adding inductance in the tube circuit to delay the rapid discharge but not sufficent for the discharge to become oscillatory.

The film shown on Friday afternoon was more of a personal one of the International Congress held in Paris this year. The annual dinner of the Institute took place the same evening at the "Trocadero."

The Diesel-electric Locomotive. By H. C. Harris, A.M.I.E.E.

A comparison with other types of locomotive

THE controlling resistances in series with the motors on an electric locomotive, which waste a certain amount of power, are unnecessary on the Diesel-electric locomotive, as the driving motors can be controlled by varying the generator voltage. The engine has several running speeds, and the generator field is adjusted to absorb full engine output.

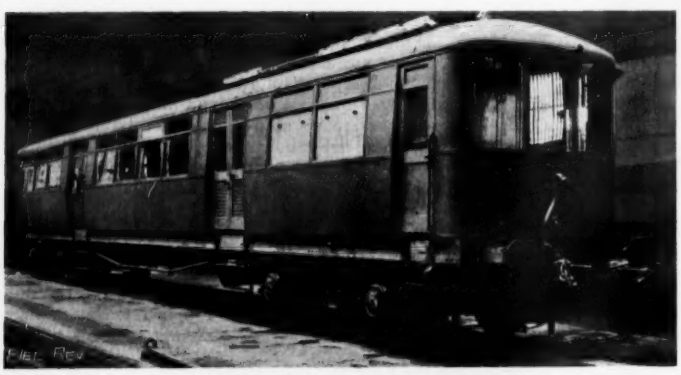
Overloading of the engine may be prevented by (1) providing a torque governor controlling the output of the generator; and (2) providing an inverse compound-field winding. An example of an eight-step control is given below:—

(1) Engine, 600 r.p.m., weak generator field, strong motor field. (2) Engine 600 r.p.m., strong generator field, strong motor field. (3) Engine 750 r.p.m., weak generator field, strong motor field. (4) Engine 750 r.p.m., strong generator field, strong motor field. (5) Engine 900 r.p.m., weak generator field, strong motor field. (6) Engine 900 r.p.m., strong generator field, strong motor field. (7) Engine 900 r.p.m., weak generator field, weak motor field. (8) Engine 900 r.p.m., strong generator field, weak motor field.

The Diesel engine is started up by motoring the generator from a battery.

Comparison with the Electric Locomotive

The Diesel-electric locomotive is self-contained, and may therefore be run on any line without a third rail or overhead conductor. Hence the purchase of this type of locomotive may take place gradually.



An Armstrong-Whitworth Diesel-electric coach

Its use involves no power losses in transmission lines, substations, &c., and there is no liability of damage to conductors by storms and lightning. A failure of power will not hold up a large portion of the train service. No fuel is burnt when the engine is standing, and the service may be varied to meet any traffic conditions.

The capital cost is very little higher than that of an electric locomotive, and there are no expensive power stations, substations, conductors, &c.

The electric locomotive has the advantage over the Diesel-electric locomotive that where dense suburban traffic is concerned, high starting acceleration is necessary, which involves a very large power output in proportion to that required when the train has reached full speed. Thus very large generating sets would be required on Diesel-electric trains to cope with the power required for acceleration only, but this is not necessary on main lines.

More Economical than Steam

Owing to the high thermal efficiency of the prime mover, the fuel consumption of a Diesel-electric locomotive is about one-eighth that of a coal-fired steam locomotive, so that with fuel oil at four times the price of coal, the fuel cost is halved.

The higher calorific value of the oil fuel (18,000 B.th.u. against an average of 13,000 B.th.u. for most classes of coal), and its liquid form, enables a larger quantity of fuel to be accommodated within the same storage space as on a steam locomotive. The nature of the fuel makes it possible to carry fuel for a twenty-four hour service without the use of a tender. As the engine is stopped when the locomotive is stationary or is coasting, no fuel is wasted as is the case where a steam locomotive is concerned.

Water filling stations are not required, a point of particular importance in countries where water is scarce. Plant for water treatment is avoided, or at any rate reduced to a fraction of that required for steam locomotives.

There is no need for extensive coal dumps with consequent ground rents, labour charges, and liability to spontaneous combustion; these can be replaced by a relatively small number of oil tanks. Fuel oil is far more easily transported than coal.

The Diesel-electric locomotive is ready for service at a moment's notice, but with steam locomotives, from half to one hour is required to raise steam. An average of twenty hours' service in twenty-four hours is given by a Diesel-electric.

With a steam locomotive it is essential to employ two men on the footplate, as the fireman's task is continuous. A Diesel-electric locomotive fitted with a dead-man's handle avoids the need for a second man. Experience with the Diesel is not sufficiently extensive to fix a definite basis for maintenance costs, but experience confirms a difference in its favour.

Operation Advantages

Smoke nuisance is eliminated, which adds to the comfort of the passengers and those residing near the railway track, and the running sheds, stations, &c., can be kept much cleaner.

From the driver's point of view, the Diesel is simple to operate, and vision from the cab is not impeded, as the driver stands right in front of the locomotive, and not at one side of a long boiler. There is no glare from the fire, and no smoke to blot out the view.

Several Diesel-electric locomotives, when coupled together, can be operated by one man only. Driving motors may be distributed on the bogies throughout the train, taking their power from the generator on the locomotive. Thus the weight of the whole train can be made use of for adhesion. The train can be driven from either end, thus eliminating shunting.

The capital cost may appear considerably higher than that of the steam locomotive, but one Diesel-electric locomotive will replace two or three steam locomotives, and the cost of the tender is eliminated. In addition, the cost of the coal dumps and water filling stations, &c., must be taken into account.

Successful operating results have been recorded for Diesel-electric working on a portion of the Canadian Railways.

Other Types of Diesel Locomotive

(1) Direct drive. In the original Diesel locomotives the engine drove direct to the locomotive axle. This gives the highest transmission efficiency, but it was unsatisfactory: first, because the starting acceleration was insufficient, secondly, because the engine had to be started by compressed air.

(2) Hydraulic transmission. This system was unsatisfactory, chiefly due to low efficiency, poor regulation, and noisy working. The starting of the Diesel engine cannot be solved in such a simple and reliable way as with the Diesel-electric drive. The difference in price between hydraulic and electric transmission is small.

(3) Toothed-wheel variable gear. This means of transmission does not compare favourably with the Diesel-electric drive: first, because its efficiency is lower; secondly, because it requires great skill on the part of the driver owing to the great inertia of a heavy train; and, thirdly, because starting is just as unfavourable as with direct drive.

(4) Pneumatic transmission. The efficiency of this transmission is low and the price and weight are very little less than for the electric drive.

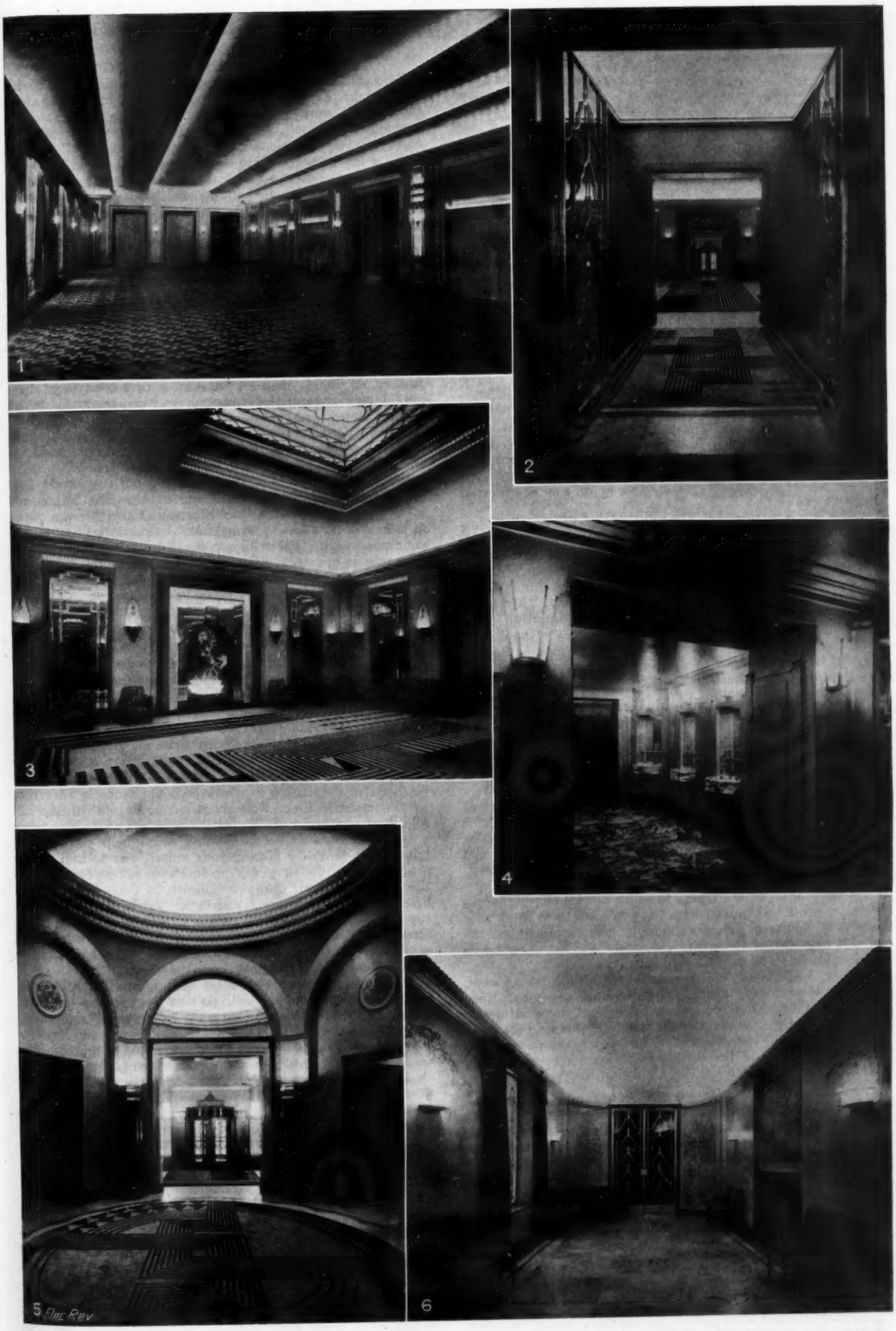
(5) Combined Diesel and steam engine. This combination tries to make use of the advantage of the high transmission efficiency of the direct drive, whilst compensating for poor starting torque by combination with the steam locomotive. The boiler must be fired even when the Diesel engine is taking all the load; hence the thermal efficiency is low, while other disadvantages of the steam locomotive are retained. Both price and weight are higher than for electric drive.

The Diesel-electric Rail Car

In recent years railways have been faced with growing competition from road transport. It is necessary for them to aim at giving the same sort of service that road transport companies are able to give; that is, door to door service with rapidity and efficiency.

The steam rail car can compete very favourably with road transport, but it is of too low power and suffers from most of the disadvantages of the steam locomotive.

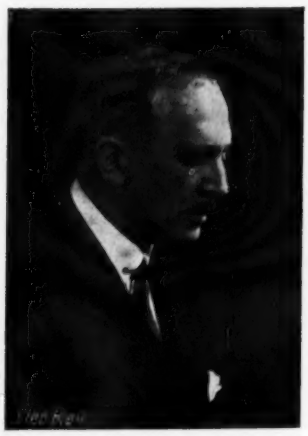
In England the Diesel-electric rail car costs between 3d. and 5d. less per train mile to run than the steam rail car of the latest type, and it is about 2½ times more powerful. Thus it has ample power to haul additional coaches, and can maintain higher schedule speeds. The higher capital cost is more than compensated for by the low running expenses.



The new Ballroom at Claridge's Hotel, London (see page 898): (1) The Ballroom; (2) A view from the Ballroom, looking through the Lobby, Reception Hall and Ante-room to the entrance; (3) The Reception Hall; (4) The Ladies' Cloakroom; (5) The Ante-room; (6) The Painted Room.

The Sales Manager. By Brig.-Gen. R. F. Legge, C.B.E., D.S.O.

Self-examination and possible results



[*Lafayette*

Brig.-Gen. Legge is General Manager of the British Power & Light Corporation (1929), Ltd., editor of "Helios," and a member of the N. Wales and S. Cheshire J.E.A.

WE may be a nation of shopkeepers, but are we a nation of salesmen? Think quietly for one minute of the situation to-day—consider the potentialities open to supply authorities in this country, and the steps that are being taken to seize the opportunities available. (Eliminate the more progressive undertakings to which this article does not refer.)

Ask yourself three questions: (a) Is there any real enthusiasm for sales? (b) What would be the effect of increasing by one half the cost of everything we sell, including electricity? (c) What would happen if we paid our salesmen on a commission basis only with no salary or expenses? The answer to (a) is in the negative, and to (b) and (c) Heaven alone knows!

What is the matter with the sales side of the supply industry? Is there a mental inertia resulting in the slowing-up of progress? If so—the combating of this inertia is not a matter for any Association or Council—it is a case of "Physician, heal thyself!" Let each sales manager take stock of himself and review his job from a fresh angle. Let him say, "My job is to sell electricity. How am I to do that efficiently? How can I obtain new consumers? On what types of appliances must I concentrate to get the best results? Which is the best way to sell each of these appliances? How can I inspire the right sort of enthusiasm in my staff?"

Showrooms Should Be Profitable

He should first consider his showrooms. How often one hears it said—"Yes! Our showrooms are run at a loss, but they are good publicity." What a confession! Properly run showrooms, of course, yield good publicity, but there is no need to lose money over them.

What about our window-dressing, which is often a deterrent to the potential purchaser? The multiple shop next door is attractive and cheerful, serving its purpose by drawing its full toll of custom. We have far costlier objects to sell, and for this reason alone our window-dressing must be of outstanding attraction.

We boast that we are trying to sell a service offering cleanliness, comfort and convenience. It is a mistake to think that ours is a sheltered industry immune from competition; we have to compete, and compete vigorously, against other forms of cleanliness, comfort and convenience.

Having brightened the window, go outside to observe, assuming the apathetic attitude of the average passer-by. Keep improving the display until it is better and more attractive than that of any other shop in the town. Preserving the same detachment, walk inside—and improve appearances there. Study the comfort of the customer—at least have a few easy chairs for the ladies to use during demonstrations.

Educate Showroom Attendants

Are the showroom attendants competent and well trained? Do they possess the three C's of salesmanship—Cheerfulness, Cordiality and Courtesy? Have they cultivated sales initiative? There are many electrical showrooms where the appropriate equivalent of "What else can I show you to-day?" has yet to disturb the mournful dignity of the general atmosphere. Point out to your assistants that possibly half of the people entering the showroom have one lamp or more needing replacement and a proportion still ignore the value of an electric iron. Pin a sales curve of these two articles where it can be seen by the staff. The results, in all probability, will enable you and them to turn optimistically to other methods of increasing sales.

The undertaking is judged by its employés, and if the latter cannot place attractively and pleasantly before the customer the merits of that which they have to sell they are useless. The misconduct or indifference of just one employé may undo the efforts of many others to give customers the square deal and fair treatment that they should receive.

Keep Canvassers up to Scratch

Your canvassers form the spear-head of the sales push; what are they doing? Their weekly reports tell an interesting story. Smith, who works conscientiously, and gives up most of his evenings to his job, has made a large number of calls but had very few entries in the "Business Obtained" column. Make a few calls with him or use other methods to see where he fails; help him out and his results may repay you for the trouble; if not, change him. Jones gets sales, yet many of his customers complain. Ascertain where the trouble lies—and keep Jones under discreet observation or you may lose the goodwill of your customers.

See that each man has hire and hire-purchase forms in his pocket, and that he knows and can explain the terms for at least an iron, kettle, cooker and fire. Point out to him that comparatively few consumers have all these appliances, and that a very large field is open by introducing them every time he makes a call. Specially good results of canvassers and salesmen should be met by immediate recognition, pecuniary or otherwise. Run competitions between canvassers on these lines. A successful canvasser must have enthusiasm, a sympathetic manner and a capacity for taking infinite pains, without necessarily the quality of genius.

Invite the sales staff to informal discussions at regular periods and give due value to any suggestions made, as emanating from the man on the job. Have your sales charts prominently displayed at these meetings; if the curves have an upward tendency so much the better. The charts will imply your knowledge of their efforts, and any increase shown in sales has its effect in stimulating enthusiasm. Systematise your sales work. The policy, pursued by a few undertakings, of carefully prepared intensive selling campaigns devoted to specific appliances, or to the obtaining of new consumers, has proved an unqualified success. Select appliances that will result in the type of load you need, fix the dates of the campaigns for the right periods of the year, and support them with a definite publicity programme.

How Manufacturers Can Assist

The actual purchasing of specific apparatus should not be based entirely on price, but rather on quality, which covers such other considerations as maintenance costs and customers' goodwill. At the same time, having carefully selected each type of apparatus that you propose to push, negotiate purchase from the manufacturer at a lower price than your previous one—it can be done. Consideration should be given to the degree to which each appliance is advertised by the manufacturer; well-advertised goods are already half sold.

Ascertain from the manufacturer what help you will obtain before definitely placing your order. Say to him, "This article is to be the subject of an intensive selling campaign on the following lines. Can you improve on that—have you any bright ideas? Can you, with your experience with other supply authorities, give me details of any successful methods already used to sell this appliance?" Do not be ashamed of asking for ideas—no one has a monopoly of them, and you may sift some useful wheat from the chaff.

Study the psychology of direct mailing; it will repay you. Collect data of existing methods and suggestions—including those from your own staff—hang the "Engaged" sign outside your door and evolve and discard schemes until you have one that appears from all angles to be sound and fool-proof. Then go all out for it until you and your assistants are living with that campaign obsessing your minds. If possible, forget that you are an engineer until you are asked to build a power-house or construct a high-pressure line. Imagine you are now just a super-salesman, in other words, "merely" a business man who is out to get revenue and profit. All this seems the very A.B.C. of salesmanship, and everybody may think he does it all and more—but does he?

"Customer-relationship"

Finally, have regard to your personal goodwill with your existing and potential customers. See to it that your name appears on the letter headings and sign all important direct mailing letters yourself, using every means to ensure that you, personally, are well known to your public. You are the man very largely responsible for friendly relations between the undertaking and its customers, and on this customer-relationship your sales business largely depends—for after all your real job is the peaceful persuasion of the public to get acquainted with and adopt a service which is economically sound and which contributes in no small measure to the comfort, cleanliness, convenience and economy of every home, shop or factory in which it is used.

Cultivate the Consumer. By V. W. Dale (E.D.A.)

The author thinks that a National Canvass should be directed primarily towards those who are already on the mains

THAT Canvass!!—national in its conception: local in its proposed operation—is it really necessary? In an area of moderate size in the heart of the industrial Midlands an undertaking is connecting three or four hundred new consumers every week: the same undertaking's rate of connections has jumped by leaps and bounds and, if it can be maintained, saturation point (as regards connected premises) will be reached within measurable time. In another area the rate at which new consumers are being connected is determined by the supply of jointers which the undertaking *cannot* get, consequently there is a continuous waiting list. One could continue to relate similar reports from very many districts where this state of cheerful confidence prevails.

But in spite of these records and reports those who are closely concerned with national electrical stocktaking are watching with not a little misgiving the progress of the Regional schemes and the prospective service of the Grid during the next few years. The unknown factor of industrial rehabilitation and the receding schemes of railway electrification make it palpably clear that over the country as a whole not only is it necessary to connect new consumers at a faster rate; it is even more essential to increase the load of existing consumers more rapidly if present charges for electrical energy are to be reduced, or even maintained at their present level.

The small turnover in relation to capital expenditure is a very real and serious handicap to the business of electricity supply undertakings, but any general increase in rates and tariffs would be a disaster of the first magnitude to the manufacturing and contracting sections of the electrical industry.

Sell More to Existing Consumers

In a previous article appearing under the heading "Sell More Electricity" (ELECTRICAL REVIEW, October 30th), particular emphasis was laid on the contention that electrical business must be *created*. The object of this further contribution is to inspire the discovery of potential business obtainable from our present consumers, either as additions to, or renewals of, their existing installations and/or equipment.

Too often this class of prospect is entirely overlooked: we are apt to flatter ourselves that we are *in*: that X is a consumer; that his units are Y, and his load factor Z; that his credit is good and his accounts are always paid promptly. It is not sufficiently appreciated that more units can be sold, load factor can be improved, and revenue increased often without entailing any additional capital expenditure, yet it must be obvious that the fewer the units sold the higher are the capital charges.

Any load that will increase the revenue from existing consumers with little or no capital expenditure is more profitable than new connections, and we should go all out to convert the domestic consumer from his miserable average of 200 or so units per annum to a practicable 2,000 average, and to persuade manufacturers to use electrical energy in industrial processes as well as for driving machinery.

What is "Saturation"?

We should be well advised to discontinue the loose usage of the word "saturation" and try to bring ourselves to an immediate realisation that even when all the premises are connected a supply area is still very far removed from the ideal which the misused word conjures.

The essence of further development and the preliminary to more efficient sales organisation lie in the discovery by every undertaking how far it is actually removed from this wider concept of electrical saturation. It is too frequently overlooked that consumers are not consumers only, but that in nearly every case they are important prospects, and in the premises of over three and a half million existing consumers there is a vast source of potential power to develop the wealth of the industry.

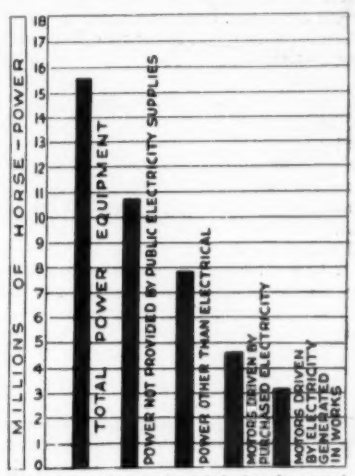
The very general investigation which constitutes the subject of this particular contribution clearly demonstrates that in every direction—domestic, business, and industrial—given astute policy and organisation, big business waits for immediate development. The adverse effects of the international crisis have affected British electrical organisations to a lesser extent than any of the other major industries. A heroic national electrical market investigation followed immediately by a national canvass on the lines which have been suggested, might conceivably enable the industry to escape completely from the more acute effects of the industrial depression.

It is not sheer apathy quite so much as a comfortable satisfaction with a steadily rising curve that is often responsible for the wide gulf dividing actualities and possibilities. Estimates which do not take into account every lumen, every horse-power, and every heat unit which could be supplied by electricity but are still provided by some other source of light, power, and heat, are not merely incomplete—they ignore the most vital contributor.

Deception of a Rising Curve

Equally, estimates of prospective business based merely on local knowledge and with regard only for local conditions are entirely misleading. For example, at a recent National Conference of Electrical Sales Managers two representatives from important industrial areas expressed an opinion that something approaching electrical saturation had already been reached with regard to industrial power. How far such an opinion is removed from actual conditions is to be seen in figures taken from preliminary reports upon the Census of Production, and shown hereunder in a very significant diagram:—

The diagram is introduced for two reasons: first to assist in correcting a misleading notion which too many of us have held concerning our percentage of industrial power; and secondly to inspire the immediate promotion of an energetic sales drive to acquire a bigger power load. In our anxiety to develop lighting and domestic supplies there has possibly been a tendency to become slack in the direction of industrial power. This tendency has undoubtedly been aggravated by a false conception of our present penetration factor and perhaps also the industry, here and there, has permitted itself to be unduly overawed by industrial depression—at all events, the diagram certainly suggests it.



The scope for industrial development

How frequently, for instance, one hears that "the gas engine is a thing of the past." However near such platitudinous utterances approach the truth, psychologically they are to be deplored; the more we resort to them the less conscious shall we be of the existence of real business prospects. That such prospects actually do exist are indicated by figures quoted hereunder showing the percentage of total gas output sold at industrial rates in a variety of towns and cities: these figures are authentic, having been extracted at random from an official gas publication:—

PERCENTAGE OF TOTAL GAS OUTPUT SOLD AT INDUSTRIAL RATES.

Smethwick	36 per cent.
Coventry	41 "
Manchester	16 "
Glasgow	12 "
West Bromwich	22 "
Birmingham	22 "
Stretford	33 "
Derby	24 "
Redditch	31 "

It may be argued, correctly up to a point, that these percentages have small relation to industrial power since gas so supplied is mainly used for industrial heating purposes: but such an argument surely merely provides another very logical reason for electrical penetration.

A Fortune in Rewiring

Amongst all classes of consumer how many premises do we know in which the existing wiring was installed a quarter of a century or more ago, and in which factors of safety and efficiency are not all that could be desired. It is not suggested that there is any serious general risk in premises wired in the early days, but both the writer and the reader know more than a few cases where an inspection of the insulation would reveal it to be perished and ready to crumble at the slightest touch.

Every undertaking can therefore secure a first-class business prospect schedule by blacklisting such "dangerous installations." It is submitted that regular periodical inspection of consumers' installations and equipment should be an essential part of the service work of all electricity supply undertakings and contractors.

Efficient maintenance is a watchword adopted by many gas companies which have recently inaugurated incredibly efficient service in this respect. A man who is well known in the electrical industry recently completely electrified his house, at the same time giving instructions for the discontinuance of the gas supply and removal of the meter. The local gas company, not discouraged, continues to send its representative—not to canvass directly for business, but because a benevolent company requires a quarterly report regarding the lighting, heating, and cooking services of an old consumer. And our contemporaries, quite rightly, are by no means less considerate to the nine million consumers which they still retain. Regular periodical inspection of consumers' fittings and apparatus is being unostentatiously carried out by all enterprising gas companies and the sooner we take a leaf out of their book the better.

Ever since the introduction of the carbon filament lamp the electrical industry has been giving impetus to the gas industry, so much so that the time has certainly come when in matters of sales organisation the gas industry can give *us* a lead, and it is recommended to anyone responsible for development work that he should study very closely papers on commercial subjects presented from time to time at "gas" meetings; moreover, he should watch immediate developments with the closest interest, if for no other reason than that he can be assured that they will be a spur to electrical vitality.

Consider for a moment what regular inspection of domestic electricity consumers' apparatus might reveal in any area.

How many lampholders contain a burnt-out lamp, or no lamp at all? This involves both manufacturer and retailer in loss of business while supply revenue is virtually cut off. How many vacuum cleaners, irons, tosters, are *hors de combat* simply on account of a frayed flexible or a damaged connector? How many fires and kettles permanently out of use because of a faulty element?

Users of electrical appliances do not immediately refer faults to repair shops: most people are inherently lazy in these matters and find it easier to "make do" with an available alternative rather than take the trouble to get their electrical appliances repaired.

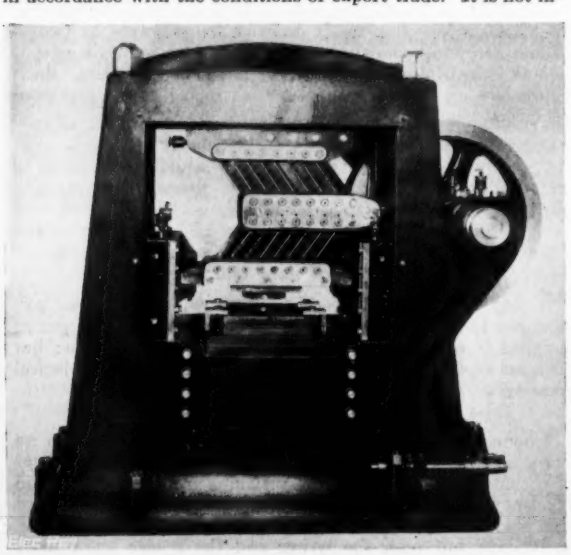
With three and a half million consumers connected to public supply mains and their number increasing at the rate of nearly half a million a year, *service* must be reinforced; indeed there can be little doubt that live service departments pay for themselves handsomely. So long as vast quantities of consumers' apparatus is permitted to remain inoperative the undertakings concerned are bearing, to an unknown extent, an economic burden in the form of idle capital. A recent computation made by the writer showed that nearly one million domestic consumers are financially able to improve and increase their electrical installation and equipment.

Deep-therapy and portable X-ray outfits by Watson & Sons (Electro-Medical), Ltd.

A Mass-production System

WE had the opportunity this week of inspecting some of the inventions of Mr. Frank Humphris, M.I.M.E., acquired by Mass Products, Ltd. These relate to a new type of industrial power press and press accessories, the whole being designed to afford high-speed large-scale production of a wide range of commodities with a considerable reduction of waste material. In some cases the "waste" can be a by-product with a greater market value than that of the main product. Many articles can be produced by multiple dies so spaced that the "waste" is left in the form of sheets of continuous network in varying styles suitable for concrete reinforcement, metal lathing, machine guards, and so on.

It is the intention of the parent company to regulate output in accordance with the conditions of export trade. It is not intended to place the new equipment on the market in direct competition with other apparatus, but rather by judicial licensing and through subsidiary commercial organisations to maintain some form of control of general mass-production schemes.



Cast-frame Humphris press

There seem to be important possibilities in this connection within the electrical industry, for the press and its allied mechanisms should lend themselves well to the production of such articles as lampholders, switch covers and internal parts, coil laminations, &c.

The principle of the press is that by the transmission of power through multiple pairs of toggle levers, arranged in parallel, pressure can be distributed uniformly over comparatively great width. It will be appreciated that driving the toggle mechanisms through a crank toggle leads to high mechanical advantage for the machine, and also that the head pressure being distributed over many toggle bearings means reduced wear and longer life.

The multiple toggles are set in herringbone fashion within suitable guides, and as the actual production pressure is an intense squeeze instead of a hammer-like blow, trouble due to crystallisation of the cutting edges of press tools should be overcome to a large extent. The possibility of the ram twisting or springing is largely eliminated because the pressure surface is maintained in true alignment with the bolster throughout its working stroke.

For embossing, forging and deep-drawing presses a relief mechanism of similar construction to that of the pressure-exerting mechanism of the press replaces the fixed table (bolster). This mechanism can be so set as to offer a rigid resistance to movement under pressure, or it can be controlled by a micrometer adjustment to yield instantly at any predetermined pressure.

A safety clutch enables the die-setter to move the ram both backwards and forwards to any desired position without the aid of jacking, barring tools or packings.

A novel design enables the tools to produce complete blanked, drawn, cupped, raised or embossed articles in rows and to eject the articles automatically into a chute without passing them back into or through the stock from which they were cut. For varying the stroke of the ram a mechanism is available with micrometer adjustment between very wide limits.

A further patent relates to plate frames for presses and other machines. They are built up in a laminar form with spaces between the plates, thus simplifying the attachment of working units to the frame. The number of plate links and members is varied so that press mechanism of any desired width can be constructed. By providing in each of the marginal edges of the sheet one or more rows of perforations, notches or slits which engage pawls of a reciprocating feed gear inaccuracies can be overcome.

There is a further aspect of the new press equipment which may be of importance to the electrical industry; it is particularly suitable for electric driving. There is still much business for the supply engineer in industry by way of the conversion of hydraulic power schemes.

It is understood that the new equipment will not be available for a few months, but the controlling company desires to acquaint manufacturers of what is maturing in mass-production schemes by virtue of the new apparatus.

Geared Motors

Modern reduction gearing owes much to the development of alloy steels

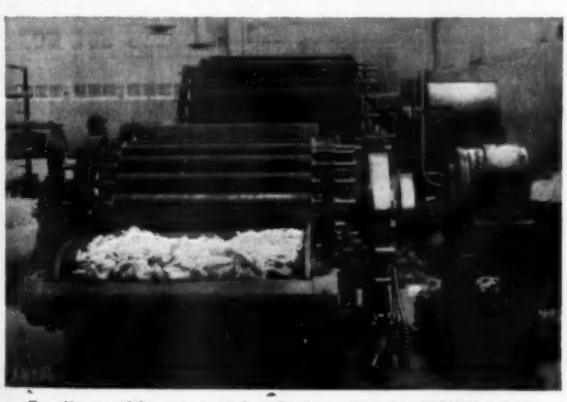
DURING recent years much consideration has been given to "flow production," and this has an important bearing on the question of whether group or individual driving by electric motors shall be adopted.

While the initial cost of motors for group drives is almost always less than that of motors for individual drives, there are many other factors to be taken into account. A true comparison can only be made by taking each particular case on its own merits, as each system has its advantages.

The essential features of the group drive compared with those of the individual drive are:—Lower initial cost of motors and startors; simpler (but not necessarily less expensive) wiring; lower total horse-power installed on account of diversity factor; additional expenditure on buildings, erection of motors, and on shafting, belts, pulleys, bearings, and guards; more expensive spare parts; greater difficulty in arranging machines in the manner most suitable to sequence of production, transport and lighting; alterations in positions of, or extensions to, machinery are most costly; higher obsolescence charges, since pulleys, shafting, etc., are worth little more than scrap price when dismantled; lower energy cost at full load, due to higher efficiency of large motors, but greater losses when running at lighter loads; higher overall maintenance and renewal costs; failure of the motor or repairs involve the shutting down of several machines; more risk to operators due to belts and external moving parts, as belt-shifting is less safe than push-button control; and less efficient lighting due to interference by shafting and belts.

The Individual Drive

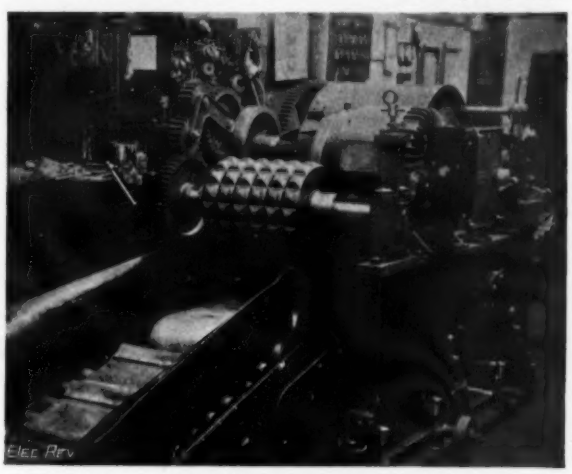
The modern tendency is towards individual drive, but this by no means indicates its suitability in all circumstances. Until recent times this system, when applied to slow-moving machinery, involved the use of expensive slow-speed motors or else reversion to belt or chain reduction, which occupied a larger space and made guards necessary. Within the last



Textile machinery: speed ratio (one stage) 1,440/300 r.p.m.

ten years considerable progress has been made in the adaptation of worm-gearing to the driving of machinery at speeds lower than those most economical for an electric motor, but the introduction of an additional speed-transformer unit increased capital and maintenance charges. Thrust losses with worm-gearing are often excessive, especially with fluctuating loads and high reductions, but silent operation is a favourable characteristic.

Spur-gearing, whether straight or single or double helical, had not been developed very much until recent years, when



Sack-printing machine driven by 3-b.h.p. 1,440/70 r.p.m. motor

individual drives became more popular. Chain drives, which are quite reasonably silent in running, are commonly used; they are not so compact or robust as separate spur or worm gears, but the total cost of installation is about the same.

Gear Box Integral with Motor

It was realised that if the gear box could be incorporated in the motor frame there would be a considerable saving in the number of wearing parts, bearings, etc. Early attempts are found in the back-geared motor, which usually consisted of a motor with a raw-hide pinion on its shaft meshing with a cast-iron wheel supported in bearings mounted either in the top of the motor frame or at its side on a bed-plate carrying the motor.

This arrangement is not very efficient, owing to the difficulty of obtaining correct alignment, and also to the limited ratio of the single-stage reduction, having regard to the size of the raw-hide pinion and cast-iron wheel. Improvements in alloy steels and in gear-generating machinery have led to the development of the geared motor as we know it to-day. This type of machine was originated some twenty-five years ago, and considerable improvements have been effected since then. These early machines employed a precision gear box split horizontally, one end of which formed the motor shell. Double-helical gearing was used and the gears ran in oil in a totally enclosed box.

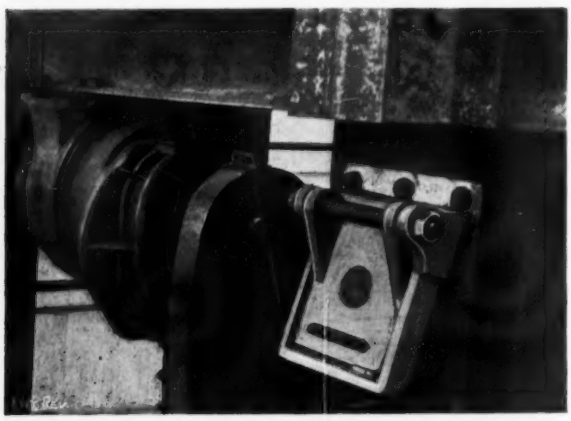
In recent years, great improvements have been made in gear manufacture. The "Crypto-Langham" geared motor utilises a standard industrial motor, one end-cover of which is replaced by a gear case, which forms one half of a gear box split vertically. The gear case is attached to the motor frame, but the increased stresses due to the reduction in speed, and hence increased torque, are transmitted through

Part of completely electrified textile mill

Geared motor in galvanising works

two lugs bolted on to a base which also carries the motor.

This construction enables the pinion on the motor shaft to be mounted very close to the motor driving bearing, thus preventing vibration due to overhang. The outer gear box cover is spigoted to the gear case; the spigot, being eccentric to both the motor shaft and the final wheel shaft, acts as a location for the two halves of the gear box which are therefore always in correct alignment and oil tight. In addition, there are no load strains placed on the bolts joining the cover



Rotary discharge valve on low-temperature carbonisation retort

and case. High-tensile alloy steel is used for the gearing, which is thus kept within reasonable dimensions.

Hardening the Teeth

Owing to the greater accuracy and simplicity of construction straight spur gearing is used for all sizes of unit. The pinion tooth form is of the corrected type, and has a higher pressure angle than normally used, so that a very strong tooth form is obtained and, since the number of teeth is never below 21, good meshing without undercutting is obtained.

The pinions are made of nitralloy steel, ensuring that during subsequent heat treatment there is no distortion possible, as the maximum hardening temperature is not above 500 deg. C. The nitriding process consists of maintaining the pinion at this temperature for 90 hours in a closed furnace, through which a stream of ammonia gas is passed. The result is that the pinions have a surface of diamond hardness, corresponding to 1,150 Brinnell, or 230 tons per sq. in. tensile, the hardness gradually tapering down into the core, which is originally treated to give 75 tons tensile. The total thickness during which tapering takes place is not more than 1/32 in.

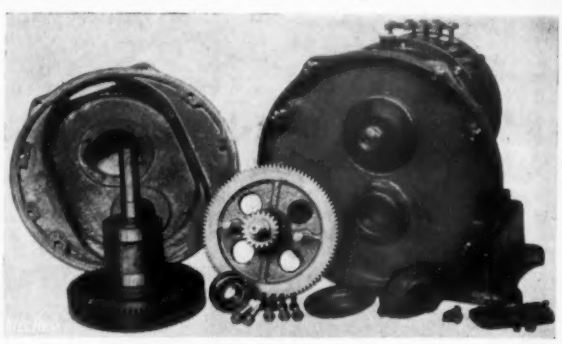
The motor pinion is provided with a screwed end so that it may easily be removed from the motor shaft. This is done by screwing on to the pinion a cap which has a threaded hole through its centre. A bolt is then screwed into the centre tapped hole; by tightening the bolt the pinion is readily withdrawn from the armature shaft. The pinion also has an oil-thrower disc fitted to its back end. This disc throws the surplus oil from the pinion to the gear box walls and prevents oil leaking into the motor casing. The motor pinion meshes with a wheel made from a 0.4 per cent. carbon steel drop stamping. The wheel stampings are heat treated to give 50-55 tons per sq. in. tensile, all machining being done after treatment.

Double and Treble Reduction

In the case of single-reduction units, the wheel is fitted to the final shaft which is made from 3½ per cent. nickel steel brought up to 65 tons sq. in. tensile. When a further stage of reduction is incorporated in the gear box, the first reduction wheel is keyed on to the compound shaft on which are cut the pinion teeth forming the second reduction pinion. This shaft is made from 65 tons tensile nickel-chromium-molybdenum steel, all machining being done after heat treatment. The compound shaft is rigid and short, and is supported on ball and roller bearings, the ball bearing being used for location purposes. The compound pinion is not made as hard as the motor pinion, as owing to the lower pitch line speeds less resilience is required and the wearing action is much reduced.

The maximum available reduction in the first stage is five to one, and in the second stage four to one, thus making a combined reduction of a maximum of twenty to one. The whole unit is very little larger than the standard high-speed motor, and is erected in exactly the same way, four bolts holes being provided in the base for fixing purposes As a rule a pin-type or other simple flexible coupling is inserted between the final shaft of the unit and the shaft to be driven.

A triple-reduction unit consisting of a two-stage unit with an extra reduction of five to one is supplied where very low speeds are required. The third pinion is mounted on



"Exploded" view of double-reduction gearing

an extension of the second reduction shaft and a further gear case and cover is fitted.

Operating Conditions Must be Known

A very large mass of accumulated experience has shown that in order to obtain the best results and the most economical machine for any particular type of individual slow-speed drive, it is essential to have accurate information as to loads at starting and running. In addition, it is desirable to know the overloads, and, if possible, the actual machine torque required under the various operating conditions.

Our thanks are due to Mr. Francis H. Schroeder, B.Sc., for his assistance in the compilation of these notes, made on the occasion of a recent visit to the Langham Gears workshops of the Crypto Electrical Co., Ltd., at Acton.

Instrument Moving-coil Supports

A CLAIM was made in the ELECTRICAL REVIEW of August 21st that the use of magnetic supports for the moving coil of an electrical instrument provides a greater degree of resiliency than that obtainable with springs. This claim is disputed by Mr. Chas. E. Foster, in so far as any comparison is involved with the "Resilia" spring-mounting system employed by the Foster Instrument Co., of Letchworth, Herts.

Mr. Foster points out that there are several systems of spring-mounting the pivots or jewels used in electrical instruments, but, with the exception of the magnetic system referred to and the "Resilia," they all rely on *individual* springing of the pivot or jewel.

"Although they are probably superior to rigid mountings, they do cause an axial shock, partly absorbed and cushioned by one pair of pivot and jewel, resulting in the momentary separation of the other pair and a blow between them when they meet again on the rebound. In the 'Resilia' design, as in the magnetic-suspension, system, the two jewels are joined together by a light staff so that separation of pivot and jewel is impossible.

"Considering shock or vibration in an axial direction, there is no physical reason why magnetic discs should be superior to springs. Neglecting for the moment the solid friction on the guides in the magnetic system, the resistance to movement will be due to air damping under the magnetic discs and to magnetic forces in the disc when it is forced into a stronger magnetic field, closer to the core. He would be a very bold man who would say that these forces are smaller than the inter-crystalline forces as the springs are distorted in the 'Resilia' system. In each case probably these internal frictional forces are negligible compared with the air damping, so that, so far, there is no ground for regarding magnetic suspension as superior to springs.

"As to friction of the jewel staff against its guides, these guides are almost certainly a necessity to the magnetic mounting because the magnetic forces acting on the discs will force them to one side, causing the system to be unstable transversely to the axis of the coil. If this is so, and practical trials confirm the assumption, this friction on the jewel staff will not be entirely free to cushion even a shock in a truly axial direction. In the 'Resilia' design there are no guides; the springs themselves provide for the centring of the jewel staff and tests show this system to be superior to all others, even for truly axial movements.

"Vibrations in service are never confined to an axial direction, and, however a shock or vibration may be originated, it will always have some component of its motion transverse to the axis. Under such a transverse motion the magnetic system is just as bad as the other systems of individual springing, the pivot point is forced sideways against the conical recess in the rigidly held jewel, which is just the most dangerous form of shock to the delicate pivot point.

"Theoretical considerations, as well as actual trials made to date, all confirm my view that my system of spring mounting is superior to the magnetic system."

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

The Future of Power Production

IN a long and comprehensive presidential address to the JUNIOR INSTITUTION OF ENGINEERS on December 4th, Dr. S. L. Pearce traced the development of transmission, its influence on the design of generating plant, and the growth of the utilisation of electric power.

Comparison of the total production and consumption per head of the population in a number of countries indicates that the co-ordination of the British system is beginning to show satisfactory results, and that some of the leeway is now being made up.

In 1930 the total energy generated in Great Britain increased by 8.7 per cent. to 16,227 million kWh, in Switzerland by 3 per cent. to 5,562 millions, and in Italy by 1.9 per cent. to 10,757 millions. It fell by 4.1 per cent. to 29,403 millions in Germany and by 2.7 per cent. to 111,305 millions in the United States.

In 1927 public plant alone sold 230 kWh per capita in Great Britain, 230 in Belgium (1928), 216 in Italy, 300 in France, 300 in Germany, 628 in the United States (1930), 815 in Sweden, and 1,825 in Canada (1928). In cities the per capita sales were 353 kWh in London (1929), 339 in Paris (1928), 250 in Berlin (1927), 636 in Shanghai (1929), 686 in New York (1929), 1,091 in Chicago (1929), and 4,008 in Winnipeg (Canada, 1929, per domestic consumer).

EFFICIENCY AND ITS COST

Substantial improvements in power station efficiency are sometimes difficult to obtain except at unjustifiable capital cost. To secure the greatest saving in first cost it is essential to use large generating sets and, more particularly, large boilers (tending towards one boiler per generating set) with such heat-recovery plant as economisers and air heaters, thereby reducing building costs.

In some cases the floor area per kW installed has been reduced by 50 per cent. With the same object in view, rather than dispense with dividing walls Dr. Pearce would prefer to place both boilers and turbines out of doors, though the saving to be achieved by doing so may be outweighed by the attendant risk.

STANDARD BOILER PRESSURES

It is probable that as soon as high temperature working (900 deg. F. or above) is established, there will be a tendency to operate at more moderate pressures (say about 600 lb. per sq. in.), although there is a move in Germany and the United States to standardise a pressure of 1,200 to 1,500 lb. per sq. in. with single stage reheating, and this cycle may be retained even when higher temperature steam is used. If any standardisation is established it may very well be in two classes—(1) 500 to 600 lb. per sq. in. and 900 deg. F. without reheating, and (2) 1,200 to 1,500 lb. per sq. in. and 900 deg. F. with single stage reheating, provision being made in either case for multiple stage regenerative feed heating to about 300 deg. or 400 deg. F., preheated combustion air to about 400 deg. F., and final gas reduced to about 212 deg. F. Combining these conditions, it is not unreasonable to assume an overall station thermal efficiency of 30 per cent. in the near future for large capital base-load stations with a high load factor, for it is becoming increasingly evident that peak-load stations ought not to be designed for high pressures or temperatures and should be as simple and inexpensive as possible.

Turbine efficiencies of from 82 to 85 per cent. are becoming common; the 85,000-kW Brown-Boveri set in the Zschorniwitz station in Germany is said to have an efficiency of 87.7 per cent. In England it is probable that multi-cylinder tandem-compound turbo-alternators of between 50,000 and 100,000 kW will be adopted for base-load stations; if such units are suitably operated in conjunction with smaller stations there will not be any immediate need for exceptionally large sets.

The size of solid steel rotor forgings will be limited to 40,000 kW at 1,500 r.p.m. and more extended use will be made of fabricated designs, notable examples of which are the three-piece Battersea generators. In some cases two distinct windings have been placed in a generator, which can be connected to separate sections of the bus-bars; experience seems to favour a generator pressure not exceeding 22,000 V.

CLEANING FLUE GASES

Effective measures are available to-day for eliminating smoke and the dust content of flue gases. A method has also been found of sulphur reduction which needs little water. It is believed that a complete and economically satisfactory solution of the problem has been found.

Generally, three-phase transformers should be cheaper and certainly more efficient than single-phase banks; the question of spares is apt to be unduly stressed. Voltage regulation will increase in importance. Switchgear is probably the principal limiting factor in electric power development at the present time.

Calculating Radiation and Convection

THE principles of calculation of low-temperature radiant heating are dealt with in the paper which Mr. A. H. Barker read at the INSTITUTION OF HEATING AND VENTILATING ENGINEERS on December 2nd. The author suggests that his method is more in conformity with scientific principles than the rule-of-thumb methods hitherto generally adopted.

The "effective" emission from a radiant panel as calculated is greater than the actual emission obtained by test, and it is that anomaly which the paper endeavours to explain. In the first place there is an essential difference between the mode of operation of a radiant surface and a convective one. The radiant calculation is made with reference to the heat emitted by the body of a person in a room, while the convective calculation is made of the amount of heat lost from a room when maintained in a certain condition of temperature, without any reference to the body in the room.

The primary calculation is based on figures given on the authority of the German physiologist, Rubner, that the normal loss of heat from a human body is by convection 138 and by radiation 195 B.th.u. per hour. It is assumed that the surface of the human body is at a mean temperature of 75 deg. and for purposes of radiation may be taken to be 15 sq. ft. superficial area, and for convection 21 sq ft., the difference being due to the fact that, while convection proceeds freely from all parts of the body, a good deal of radiation from some parts is suppressed or trapped by other parts, just as most of the radiation from the columns of a radiator is absorbed by other columns and does not emerge into the room.

It is then shown that for this dummy body various conditions of radiant and air temperature may be laid down which will procure from such a body a total heat loss of 333 B.th.u. per hour, as stated by Rubner. According to the current theory the conditions of heat comfort in a room are that this should be the amount of the total heat loss, and that it is more or less unimportant how that loss is sub-divided between radiation and convection.

A detailed description of the proposed method of calculation

The Radiological Exhibition (*see pp.* 871-3): **Deep therapy equipment.—(Left) By A. E. Dean, as installed at the London and Middlesex Hospitals. (Right) By the Solus Co., for St. Vincent's Hospital, Melbourne.**

is extended to the important case of warming spaces in the open air, in which it is obviously impossible to raise substantially the air temperature, and examples are given of installations which have been carried out in this way in practice.

The same principle is applicable to the warming of the occupied spaces in large buildings, such as churches or cathedrals, which it is practically impossible to warm uniformly by any convective method. This leads to a discussion of a suggested graphical method of determining the mean radiant temperature at any point in a room heated in a miscellaneous manner by hot surfaces scattered about the room.

The last part of the paper makes suggestions as to the kind of research needed to establish the principle of radiant heating on a sure foundation, thus enabling installations to be designed in a scientific manner.

Change-over Considerations

PROBLEMS confronting the consumer in areas where the public d.c. supply is being changed over to a.c. were discussed in the paper which Mr. H. Nielsen read before the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS on December 3rd.

Small installations, the author says, will have to be renewed, but power plant above 500 kW in capacity may be retained if suitable incoming switchgear and converting plant are installed. For an average installation of 1,000 kW the author "easily" disposes of both steel-tank and glass-bulb mercury rectifiers for several reasons. He then compares the three types of rotating machine, between which he sees little difference except in one respect.

The rotary convertor is a solid coupling between the a.c. and d.c. supplies, and whatever disturbance takes place on one side must be transmitted to the other. A motor convertor acts partly as a rotary only and partly as a straight d.c. generator, with the result that it may be looked upon as a flexible coupling; it will often "hang on" to the supply when rotaries have tripped out, and flashovers are practically unknown. It is as well to bear in mind, however, that to get the full benefit of a motor-convertor moderate speeds should be adopted. With a rotary a transformer is necessary, so allowance has to be made for this in the laying-out of the plant. With two-bearing motor-convertors the saving in floor space, as compared with a three-bearing machine, is from 15 to 20 per cent.

CONTROL GEAR AND WIRING

It may be possible to utilise existing d.c. panels to control the new converting plant, but a new "line contact circuit breaker" may be of interest. It incorporates a new form of laminated contact in the form of vee-edged blades which bed into corresponding grooves in the contact blocks, the number of blades depending upon the required capacity. Each blade carries 125 A and is held in contact with the vee groove by a spring which exerts 28 lb. pressure. When fully loaded the voltage drop across the blade and contact is only 8 millivolts, two of which are accounted for by the resistance of the blade.

To scrap existing d.c. plant and convert to a.c. throughout means redesigning the complete wiring system and probably renewing the cables for power purposes, but it may be possible to save the wiring for the lighting system, if designed for 230/250 V.

The usual a.c. supply is 400/440 V, three-phase, 50 cycles with an earthed neutral. If new four-wire cables are run throughout, it is possible to tap off lighting circuits at any point between the outers and neutral, but care should be taken that fuse boards are split up so as to divide the load as equally as possible between the three phases.

It should be remembered that 230 volts a.c. is the r.m.s. value and the peak value is $\sqrt{2}\times230=330$ volts, so the insulation must be suitable for this higher voltage. Also with this method single-way switches may be retained, providing they are on in the live side of the circuit. If, however, the neutral is unearthed, the Home Office rules demand the installation of double-pole switches, which, in most cases, would mean very large alterations to the existing wiring, adding to the change-over costs.

MAINTAINING THE LIGHTING

With both of these systems should a fault on the power side trip a particular switch, the lighting in that section of the works would also go out of commission, which is very undesirable. Many engineers, therefore, put in separate lighting transformers, fed straight from the main switchgear, and these transformers could, if desired, be Scott connected, either with an earthed mid-wire or single-phase secondary.

A great deal of attention has recently been given to distribution boards made of steel plates or c.i. busbar chambers with independent outgoing combined switches and fuses for each circuit, which have proved much more accessible and reliable than old-fashioned fuse boards.

The latter half of the paper is devoted to the selection of motors and starters and their correct rating, with a view to power-factor improvement and its bearing on kVA maximum demand tariffs.

Diesels in Power Stations

SOME recent developments in Diesel engines for electric power generation are outlined in the paper which Mr. E. R. Walter read at a joint meeting of the East Midland Section of the INSTITUTE OF FUEL and the East Midland Sub-Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Nottingham on December 8th.

The characteristic curves of fuel consumption and overall economy of the Diesel engine plotted against load show that there is a large range of load on either side of the most efficient load for which the efficiency only slightly varies from the maximum. This allows a fluctuating load to be carried with high efficiency.

Now that combustion has received such a large amount of attention, it is certain that the air-charge may be more completely utilised for burning. Engines are now built wherein the excess air is of the order of 25 per cent. and the mean effective pressure 140 lb. per sq. in. However, by reducing the ratio of air-charge to fuel, or, in other words, injecting a greater amount of fuel into a given air-charge, temperature will rise with pressure with consequent heat leakage.

The greater temperature difference causes an increase in temperature stresses. This last point and the question of reliability probably make designers somewhat reluctant to produce a heavy-duty engine.

SUPERCHARGING

By the use of superchargers, high temperatures with their resulting stresses are obviated, and equally high or higher mean effective pressures are produced. A decided increase in output against fuel consumption is noted. Opinions appear to be divided with regard to the use of the turbo blower using the exhaust gases for its source of power or the electrically driven blower.

Another useful application of super-charging is its adoption where an individual prime mover has to carry a heavy transient load, using supercharging apparatus which may be uncoupled without stopping the engine, when the load falls to or below the normal rating of the engine. Most makers are now fitting superchargers, but a tendency is showing itself to make the engine somewhat larger than the normal power required, anticipating that the lowering of efficiency due to its low loading will not be excessive.

TYPES AND COSTS

It is anticipated that Diesel engines may be produced at a price well below £2 per h.p. For large powers there is a marked preference for the two-stroke cycle type. The double-acting engine can be designed to work on either the four-stroke or two-stroke cycle, and it appears that the double-acting two-stroke engine will finally become preferable, in that it offers better utilisation of material than the double-acting four-stroke Diesel.

Size, efficiency, ease of starting and control make the Diesel engine very suitable for peak-load duty. Capital and operating costs are quoted for plant installed in Great Britain and abroad. The size and number of such engines have increased greatly, and plants are now in operation of aggregate outputs of 120,000 b.h.p.

On request being made for a prediction as to future progress, practically all the replies showed disappointment that development, which had been so rapid, was now practically at a standstill. Great hopes, however, were entertained for its future, when the universal depression disappeared.

Safety in Mines

THE fifth of a series of SAFETY IN MINES CONFERENCES was held in Manchester on December 5th. The Secretary for Mines (Mr. Isaac Foot, M.P.) presided, and addresses were given by Sir Henry Walker, Chief Inspector of Mines; Mr. W. J. Charlton, Divisional Inspector; Prof. R. V. Wheeler, Director of Research Stations under the Safety in Mines Research Board; and Major H. M. Hudspeth, mining engineer to the Board.

Sir Henry Walker said that the number of deaths caused by electricity in mines in Lancashire and Cheshire during the years 1928, 1929, and 1930 was only one in each year, which, at a rate per 100,000 man-shifts worked, was negligible.

Mr. W. J. Charlton said that in 1930 there were 57,910 persons employed underground in Lancashire and Cheshire; 71,662 safety lamps were used, of which only 18 per cent. were electric. In the North Wales area there were 11,537 persons working underground, for which 14,121 lamps were utilised, 33 per cent. being of the electrical type. During 1930 there were 1,751,984 lb. of explosives used in the Lancashire and Cheshire coal fields in 4,375,911 shots. This worked out at 1 lb. of explosive per nine tons of coal worked; 99 per cent. of the shots were fired electrically. During the same year, 26 per cent. of the output was obtained by coal-cutting machines, of which 10 per cent. were electrically driven.

MINES ACT RESTRICTIONS

Referring to the Coal Mines Act, Mr. Charlton said that Section 60 (1) definitely prohibited electricity from being used where explosives fired by this type of ignition would prove in any way dangerous. Section 60 (2) provided that when the amount of inflammable gas exceeded 1¼ per cent. then all electricity was to be cut off. He anticipated an advance in the use of high candle power electric hand lamps, which would follow the inevitable development in machine mining.

Mr. Percy L. Wood, chief agent of the Manchester Collieries,

Ltd., in opening a discussion, said that better lighting would probably make more for safety than anything else. The miner could not fight danger if he could not see it. The flame safety lamp gave only half a candle power at the end of a shift, whereas a regulation provided that electric lamps must give 1.3 candle power after a shift of nine hours. An electric safety lamp was now on the market of 3 candle power before the shift and 1.5 candle power after the shift.

Mr. John McGurk, president of the Lancashire and Cheshire Miners' Federation, said that electricity at the coal face was an added danger to the workmen. No doubt this form of power was cheaper than compressed air, but human life was very dear to the individual.

GUARDING AGAINST ACCIDENTS

On the subject of "Explosions" Prof. Wheeler said that if the regulations were observed, namely, that "men shall not work in an atmosphere containing 2½ per cent. of gas, and that electric power shall be cut off if 1¼ per cent. of gas is exceeded," then there could not be firedamp explosions.

It was not always possible to observe the regulations, however, so a second line of defence was necessary. To this end other regulations had to be made regarding taking matches down the mine, the kinds of lamps that might be used, the kinds of explosives, shot-firing batteries, electric signalling bells, and other electrical apparatus generally. The too-frequent occurrence of shot-firing accidents must cause everyone concern.

Although the accidents due to the use of electricity were remarkably few, it should be remembered that "flameproofness" depended essentially on the efficiency of maintenance. A bolt missing from a "flame-proof" casing would cause, and had caused on several occasions, disastrous firedamp explosions. There was one direction in which he thought electricity might be extended with advantage, namely, in underground lighting. Provided that it could be done without adding any additional danger to the workman, he was of the opinion that safety in mines could be improved by more effective lighting such as electricity could provide.

Mr. H. Richford said that the increased use of electric hand lamps had resulted in a very great reduction in accidents.

British Mining Electrical Plant Leads

THE annual dinner of the West of Scotland Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS was held in Glasgow on Saturday last. A company of about 160 was presided over by Mr. Arthur Dixon, and those present included Professor G. W. O. Howe, chairman of the Scottish Centre of the I.E.E. Major E. Ivor David, president of the Association, was prevented from attending by ill-health, and his place was taken by Mr. Frank Beckett, senior vice-president.

In proposing "The Association," Mr. S. P. Hodge said that the coal trade were suffering to-day as much from a surfeit of legislation as they were from competition among themselves. The 1930 Act had not brought one iota of benefit. Under the Act it was possible, in his view, to have established some system of central selling, but coalowners, and especially the most influential coalowners, were very individualistic, and so the endeavours to get the powers to sell coal centrally, and thereby obviate the cut-throat competition which was the bugbear of the trade, had come to nothing.

Replying to the toast, Mr. Frank Beckett mentioned that the Association had been formed about twenty years ago, as it was felt that the technical societies did not offer sufficient opportunities for the consideration of problems peculiar to electrical engineering in the mines. Its establishment had been amply justified in these years, and it had undoubtedly contributed a great deal to the progress made—a progress that warranted the claim, he thought, that the standard of electrical plant in British mines was now superior to that of any other country. He believed also that it could be claimed that the development of general electrical machinery had followed the development of mining plant. That development had come in the main from the increase in the number of coal-cutters, and still more from the increased use of coal conveyors.

Mr. A. F. Stevenson, in a witty speech, proposed the health of the guests, and Professor G. W. O. Howe, responding, said that during the past few years we had been living in a fool's paradise, and we now knew something of the consequences. He was afraid that we had more yet to learn. As an electrical engineer he had not, like the politician, an infallible cure to offer, but he thought that there was at least a partial remedy, or probably the view put forward by Captain Donaldson at the recent I.E.E. dinner was one of the best ways out, and that was—a policy of hard work.

Yearly Contracts for Heating Buildings

AT the last informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS Mr. R. Grierson opened a discussion on the electrical heating of buildings. He said that he had to make a charge of indifference and lack of knowledge against those concerned with the matter, which hampered a splendid development.

The main ground of his charge was that it was difficult to find calculations for heating buildings which included any allowances for the sources of casual heat from lamps, occupants, and, in the case of southern rooms, for the sun's heat which was radiated even on a dull day. Further, there was quite insufficient use of thermostatic control, which with unfailing accuracy could keep buildings at a predetermined heat, preventing the overheating and waste that were so very common. Every room presented its own conditions and required individual consideration.

Mr. Grierson believed that the time had arrived for the supply authorities to offer quotations for the yearly heating of buildings at a guaranteed temperature regulated by thermostats; this with intelligent control could be an entirely off-peak load. Without advocating any particular system, Mr. Grierson very naturally took pleasure in mentioning the British Embassy at Washington, a new building designed by Sir E. Lutyens, where the ceiling panel system had been described by an American firm of consulting engineers as a remarkably efficient job, saving some 40 per cent. of the running cost of standard practice.

Mr. D. J. Bolton said that the advantage of electricity was that one could place it where it was required. He referred to the new practice of push-button control of consumers' meters by superimposed circuits.

Mr. W. Rawlings thought that Mr. Grierson was doing the industry very great service in his rôle of champion of electric heating. For the office or the large room, ceiling-panel heating seemed by far the best system. He wished the authorities would give a 24-hour supply of electricity through a limiter for any application whatsoever; this would enormously develop the use of every kind of electrical apparatus.

Electrical Association for Women

LAST week at the Technical College, Glasgow, under the auspices of the ELECTRICAL ASSOCIATION FOR WOMEN, Prof. Parker Smith lectured on the "Maintenance and Care of Domestic Electrical Apparatus." The ladies present received a booklet written by the lecturer.

"Your Servant, the Telephone," was the title of a lecture given to the Edinburgh Branch of the Association by Miss A. E. Simonsen, of the Telephone Development Association. She pointed out that in America shopping by telephone had now reached a fine art. In one St. Louis store 25,000 items had been ordered by telephone in three hours. She advised her hearers to allow the telephone to do the daily round of the shops.

Mr. G. S. Francis, of the British Electrical Development Association, lecturing to the members of the Hartlepools branch of the Association, dealt with the relation of electricity as an illuminant to the tendencies of modern architecture. He pointed out that it was already having a marked effect on architectural style, and he prophesied greater changes in the future.

Matter's Wave Form

Practical results of the modern theory that matter sometimes behaves like waves were recorded by Professor G. P. Thomson last week at the Royal Institution.

The wave properties of electrons have enabled him to obtain a pattern on a photographic plate, which indicates that a polished surface seems to have many of the properties of a liquid. Films only eight atoms in thickness have been investigated by the same means, and an abnormality of structure has been discovered which, it is hoped, may eventually prove useful. Just as science has added the conception of the particle to the wave theory of light, so the conception of waves must be added to the particle theory of matter. A series of patterns obtained from the passage of electrons through thin layers of matter are analogous to the effects which can be produced on a still surface of water.

A Mixed Grill

At a meeting of the North-Western Section of the INSTITUTE OF FUEL, held in Manchester on Wednesday last, four papers on widely different subjects were presented. The first dealt with the use of the tungsten-molybdenum thermo-couple for the measurement of high temperatures. Mr. N. Simpkin, of the Lancashire and Cheshire Coal Research Association, treated of coal standards, and described methods of sampling. "Steel Impurities" was the subject of a paper by Mr. J. C. Pooth, who had something to say upon the effects of oxides, silicates and sulphides in steel, regarding which little information is available. The fourth contribution dealt with the automatic remote control of boilers, with special reference to the selection of boiler-room electrical apparatus.

Cleaning Coal

The paper which Mr. L. W. Needham presented at the Midland Section of the INSTITUTE OF FUEL at Birmingham, on December 10th, contains a résumé of the processes available for the collection and treatment of slurry. It also gives an account of experimental work conducted with the object of gaining an understanding of the behaviour of clay-like refuse in water and the consequences of its presence in washery water. The results show that a semi-colloidal refuse is very potent in hindering the settling of solids upon which depend efficient slurry collection and water clarification. Flocculation by means of electrolytes and other colloids as a method of overcoming the difficulties due to slime formation is discussed, and experimental results indicating the possibility of its successful application are given.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

British Glassware *is* Available

It is pleasing to note from your Correspondence that the electrical trade is taking an interest in the vast amount of illuminating glassware which is imported, and the trader should carefully consider whether he will purchase a foreign article, thus adding to our adverse trade balance and increasing the difficulties of our country.

In the past, for various reasons, we have imported all our "Efteelite" glassware, but we are now able to supply this manufactured in England, of a quality equal to, if not better than, the foreign article at prices which compare favourably. Our metal-work has always been manufactured at our own works in London, and we can now offer an article which is entirely of English manufacture.

If the trader will specify "English manufacture" on his inquiries, he will generally experience no difficulty in having his requirements attended to, and at the same time he will be doing a service to the British Empire.

FREDK. THOMAS & CO., LTD.,
T. R. Dinnett, *Sales Manager.*

London, N.W.1, *December 5th*, 1931.

Canvass the Country

There will be general agreement with the fundamentals outlined by Mr. W. E. Swale in your issue of December 4th under the six headings which I need not repeat.

I do not agree, however, that the whole organisation should be left entirely in the hands of engineers. It is agreed that with regard to power supply for industrial purposes, the technical man should be the first to open the ground, but the power supply has made such rapid strides in recent years that we shall soon be reaching saturation point in this direction.

What we are more concerned with is domestic electrification. Regarding lighting, there is no doubt that the industry holds the market and will continue to do so in our time at least. The field that we have now to explore is the use of domestic appliances in the home, which, as must be admitted, has very great potentialities, and the engineering salesman cannot alone fertilise this ground.

The engineering salesman has his value, but the commercial man also has his. Many have had years and years of experience in salesmanship in the broadest meaning of the term, and during this period have been compelled to acquaint themselves thoroughly with the technical side of salesmanship. This also applies to many of our lady demonstrators and saleswomen.

The efficient salesman may be considered the life of any concern, as upon the results of his activities the success of the industry depends. We can now, thanks to the activities of the Central Board, produce efficiently and in abundance, but if the Central Board's efforts are not supported by efficient selling of the commodity the position will be one of uncertain speculation.

In conclusion, I would state that a National Commercial Electrical Supply Association is imperative.

December 5th, 1931. SALESMAN.

Mr. W. E. Swale's article in your issue of December 4th is bound to create a great deal of discussion, and it is well in evidence that the building up of load can only be done by a concentrated personal canvass. Advertising can only be a secondary consideration; in every large town and city numbers of business premises and works are an advertisement to the supply company. There are, on the other hand, thousands of premises which need to be educated regarding proper methods of illumination. This alone should result in a huge increase of load.

The question of sales staff is one which should be gone into very carefully to find the right man for the job. As we are now branching out into rural districts and shall be dealing with numbers of humble cottagers the canvasser must be capable of coming down to their level. It is useless for him to talk about "kilowatt hours" or "units," as these people want to know the cost of running and installing in £ s. d.

If it is possible, arrangements should be made for the canvasser and the contractor, who is working in the area, to make their calls together, and the supply company should ensure that the same canvasser covers the district on each successive occasion. Nothing annoys a householder more than to have different people on his doorstep practically every week inquiring about electricity, whereas after one or two calls by the same person or persons the householder is generally prepared to have a chat, and in time becomes a consumer.

The best procedure is to make a call during the daytime and find out when the man of the house is due back from work, and make arrangements to call in the evening after he has had the opportunity of having his meal and reading through any literature which you may have left for his perusal. If the canvasser is given a few hours off duty in the morning he is usually prepared to extend his working hours to 8.30 p.m. or 9.0 p.m. Far more results are obtained by a few calls in the evening than many during the daytime.

The meter reader of the supply company has an excellent opportunity of building up load on existing consumers' premises. He visits every consumer at least once every quarter and can talk to the housewife about the various appliances. He could then make a note of any consumer who is interested in any electrical apparatus, and pass the information on to the consumers' or canvassing department to follow up. In this way many additional appliances such as irons, kettles, toasters, and radiators would be installed upon the premises.

One supply company a little while ago purchased 100 electric irons and sent them on a month's trial to those consumers who were not already using them. In a short time hundreds of irons were added to the supply, and, as the majority of these were used on the lighting supply, they resulted in a much greater revenue and better load factor than for the preceding year from the same consumers.

A call on each consumer at least once a year helps to give the consumer confidence in the supply company, and in the long run well repays it for the time spent.

T. ELIAS.

Gloucester, *December 5th*, 1931.

Shame!

The recent extensive correspondence in your journal regarding increased domestic utilisation of electrical energy and enhanced activities of the B.E.A.M.A., with a hint that the I.E.E. should collaborate or independently support such work, must interest all members of the electrical industry, but I am confident that the Institution of Electrical Engineers would make a great error if it associated itself, in any way, with commercial matters. Strict retention of its professional aspect is of paramount importance to all who are connected with electrical engineering.

There is, however, no reason why our Institution should not become exemplary in the application of electrical energy to every conceivable purpose. Steadily, but apparently with difficulty, the illumination of its various rooms, and the lecture theatre, has been improved, and there is still considerable scope for betterment, for up to now no reaction is evident to the inspiring contribution presented by Dr. Luckiesh to the recent International Illumination Congress entitled "Humanitarian Foot-candles."

The liquid refreshments served at meetings from capacious urns have no electrical heating applied to them, while in the large lavatory no electrically produced heated, hand-drying air blasts are available. The substitution of impelled warm air for the large supply of towels, with that abomination, the ring towel, should be itself an economy and certainly a salutary example to other establishments where many people desire to wash their hands. There may be other applications where our headquarters can set a good example.

ONE OF THE OLD BRIGADE.

December 1st, 1931.

Still the Boiling Plate

The article by Mr. A. J. Howard in your December 4th issue forms entertaining reading, but perhaps one or two comments upon it may not be out of place. The portion covering early experiments is interesting but is simply the sort of thing we have all gone through in these matters, and indeed I was boiling liquids many years before the advent of the nickel-chromium wire, and, moreover, without the aid of any wire.

Much, in fact could be said by early experimenters about special utensils designed for better results, and methods of heating comprising all manner of hot plate designs, external contacts, and methods involving conduction, internal resistances induction, and by external and internal arcs. Some of these on the surface seem to be only of academic interest, but one never knows where they lead in the long run, as a method of boiling water by means of an internal arc was found to have one of its peculiar characteristics wrapped up in the highly superheated steam surrounding the arc, and this, due to contamination, led to the idea of generating the steam separately and using this as the vehicle.

Although some of these methods were of questionable practicability they taught us two things: to study efficiencies quantitatively, and that the field in these matters was extensive. Our present problems, however, involve the evolution of a really efficient boiling plate together with perhaps the economical production of cookers and similar contrivances.

When setting a standard for the boiling plate one is tempted to state "with gas ring characteristics," but this is not enough, as although such rings are readily controllable a large amount of heat is still wasted. It is this matter of heat transference that is the vital problem and it is one of more complexity and scope than seems apparent at first. It is of course possible to get quick boiling by a large expenditure of energy to overcome losses, but this is not what we require. The matter of control also, as already indicated, is important, but is only subsidiary to the problem of thermal conduction, and when once the latter is nearer perfection the former will be considerably simplified.

It would therefore seem a little early to worry about the weights of transformers and the costs of switching and leads,

as we are still only toasting the utensil by placing it near a red hot grid, where it is carefully insulated by a layer of air; or by inefficient conduction, due to badly bedding plates and utensils—both manifestly inefficient methods.

Mr. Howard denies that the gas oven is as efficient as the electrical type and invites sceptics to consult the cooks, which seems to indicate that he is viewing this matter from the operator's standpoint instead of an engineer's. There is no mystery about the measurement of the efficiency of a boiling plate as a given result should involve the expenditure of a certain amount of energy and it would be better if we heard more of this sort of thing instead of leaving it in the air as at present. In this connection Mr. Howard states that so far as the a.c. boiling plate is concerned the troubles have now been tackled and solved, but he gives no figures, and if the device in question incorporates some of the drawbacks already outlined, it would appear that we are still as far off the perfect "plate" as ever.

After all, the efficiency is the thing, and in this respect the arrangements usually found are not even level with the kettle idea that he mentions. All this points to the fact that we have hardly started research, let alone finished it, and the present methods of progression might be somewhat improved upon.

For instance, suppose we take a plate as made to-day, recess and amalgamate the top, and fill it with a stiff amalgam paste, placing upon it an ordinary aluminium pan resting upon three studs to prevent its making contact with the bottom. This is not intended as a serious design, but similar experiments would probably cause many people to modify their views considerably upon the probability of the ordinary plate being liable to improvement. Moreover, this is but one avenue; there are others, and they serve as a starting point in the scientific sense, although in this case we should go much further back than the amalgam to get the full results.

The same thing applies to fires. On the one hand we have the spiral wire refractory element with a half-hearted method of parabolic reflection; and on the other hand the more scientific arrangement which is unwieldly, less efficient on the low heat, and gives a glare, which cannot be said to be satisfactory.

Again, when we come to production costs it is not easy to account for the present high prices. Viewing things in the light of another industry where large numbers of complicated parts have to be machined to fine limits from expensive materials, difficult to work, and considering the prices charged for the finished articles, it is difficult to believe that the production side has been tackled with any vigour.

To wind up, it is by no means certain that an electric cooker, superior to gas in all ways, cannot be produced commercially, and although the foregoing remarks may seem a little drastic it should be remembered that they are only advanced with a view to getting at the true position, by which means alone we are able to advance. I am not connected with any cooker or fire at present on the market, being interested purely from the standpoint of a research and production specialist; no doubt astute readers will be able to pick holes in these notes but this, of course, is all to the good.

CHARLES E. BAXTER.

Huddersfield, *December 5th*, 1931.

Several correspondents have suggested a combination of electric cooker and gas ring. Well, why not? In a leaderette you mention a still more monstrous hybrid, coal and electric. In this district there is a large number of coal and gas combinations, which you might also regard as monstrous if not distinctly dangerous, yet they appear to be quite satisfactory.

Surely "Electrigas" could not be a more monstrous hybrid than this? And how about the domestic hot water supply, in many cases heated from a coal fire with an immersion heater in the tank for use in summer when there is no fire?

December 5th, 1931. E. H.

We have been very interested in the recent correspondence in your journal under this heading, and the article in your issue of December 4th, entitled "Heating and Cooking Notes," by Mr. A. J. Howard.

All the writers are fighting shy of facing up to what is considered a problem, but need not be a problem at all. No one to-day would think of purchasing a motor car without wheels, and then fitting on any old wheels which they had by them, or without electric lamps with the idea of fixing on their old ones. Why, then, should electrical engineers still persist in sending out electric cookers without proper equipment? A flat-bottomed utensil which will not distort is essential; therefore why not supply it instead of crying for the moon?

The enclosed hotplate has come to stay, and the modern plate is most efficient from every point of view. Its advantages are many over the open-element type. The retained heat in the plate after switching off is a most valuable economic factor, providing flat-bottomed utensils are used. Food can be kept simmering for over half an hour, and hot for well over an hour. Women who are provided with flat-bottomed pans are enthusiastic users, and this is giving a fresh impetus to electric cooking.

The problem disappears if only a little imagination is used, but so long as the supply authorities think it no part of their job to see that the cooker which they are installing is correctly equipped with utensils, then we must continue to have people sending back their cookers. Why allow the risk of a woman taking half an hour to boil three pints of water on a cooker, when it can be done in ten minutes? Why think you have solved the problem by supplying an electric kettle? You have merely closed your eyes to what is expected of any cooker, or you do not know what women do in cooking a meal. They may not wish to boil just water, it may be vegetables, soups, stews, &c. Ask any lady demonstrator what a woman wants to do with the hotplates. It is just like a mere man to say, "Oh! give them a kettle." How would he like to cook with a kettle? Moreover, who maintains the kettle, and what does the maintenance cost?

Have those who are writing any idea of how the problem is being solved by many supply authorities, and, incidentally, how they have solved a greater problem, *viz.*, the maintenance of hotplates themselves? If an incorrect type of pan is used, a hotplate can become red hot on one side, because the heat is not being absorbed from it.

The electrical engineer does not appear to recognise that the electric cooker is the finest medium yet invented for cooking, and he has not made himself conversant with its possibilities. He employs lady demonstrators without recognising what they are actually teaching. Any good housewife to-day will bring her vegetables to the boil, switch off, and the vegetables will be cooked without any further current by the heat retained in the hotplate, providing she is using flat-bottomed utensils.

pp. Hague & McKenzie, Ltd.
T. N. VEITCH.
Birmingham, *December 4th*, 1931. *Director.*

Factory Sites

My Council is informed that you have received numerous inquiries from manufacturers for suitable factory sites, and I am accordingly instructed to bring to your notice the very excellent position of this town for manufacturing purposes.

Witham is situated midway between Chelmsford and Colchester, on the main Eastern Counties road and the main London and North-Eastern Railway (Great Eastern Branch) serving the whole of East Anglia. It is a junction for Maldon, and Braintree-Bishop's Stortford line, joining up with the main L. & N.E. Railway (East Coast Route). It is also within easy distance by both road and rail of the London docks and Parkston Quay.

Immediately outside the town there are good factory sites available at low prices awaiting development. Electric power, gas and water are available, with plenty of labour. For manufacturers desiring to secure good sites this town should greatly commend itself, not only from the foregoing, but on account of its geographical position.

If you would be so good as to refer to me such inquiries received, I shall be only too glad to give any further local information desired, and my Council will be very willing to give all the assistance it can give to persons desirous of commencing business here.

F. G. BRIGHT,
December 4th, 1931. *Clerk, Witham, U.D.C.*

Electrical Trade in Malaya

Now and again articles appear in the electrical Press on the subject of electrical trade possibilities in Malaya. Some of these, of course, are in the nature of reports of the British Trade Commissioner, who is under the direction of the Department of Overseas Trade.

It is a very fine idea which prompts the Department to install a Trade Commissioner in a place like Singapore—I am sure quite a lot of valuable information can be provided through his reports to the D.O.T., but I also think that still more valuable information from the British manufacturer's point of view would be available if information regarding the level of competitors' prices could be given.

One of the most recent reports on Malaya which I noticed concerned the potential market in this country for domestic electrical appliances; this was extracted from a report made to the D.O.T. by the Trade Commissioner. I wonder if manufacturers following up such an extract could gain any information on the competition, both in price and quality, which they would have to meet if they seriously intended to take a hand in the market.

Intense competition is prevalent in Malaya in all classes of electrical machinery and apparatus, not solely between British and foreign manufacturers. There is also competition between goods of British manufacture, the business being done chiefly through agents who, like merchants, work on a very small margin of profit. Apart from firms like the G.E.C., etc., little or no sales effort is brought to bear on the buyer or consumer. This condenses itself down to the fact that articles are sold mainly on price.

Eastern markets, particularly, once they have experienced keen competition in price, are not going to pay any great amount of attention to sales propaganda on behalf of higher-priced goods. Scotsmen are reputed to be hard nuts to crack, and the Jew may be able to give him a few points, but a Chinaman down on his luck, as most of them are in Malaya to-day, is adamant when you try to sell him a superior article at a somewhat higher figure, as against a lower-priced inferior article. The Chinese represent over fifty per cent. of the population of this country. If business of any reasonable magnitude is to be done the Chinaman's interest must be aroused. The European population of Malaya is only a very small proportion of the total.

The import and export figures for Malaya are liable to give an exaggerated idea of the potential market. The bulk of the electrical machinery and plant which comes into the

country is mostly imported by Government departments, supply authorities and municipalities. In the case of the first-named the material is ordered in England by the Crown Agents for the Colonies, and in the case of municipal electrical departments most of their requirements are obtained through their London agents. I suppose there is only one concern which could be classed as an electrical supply company, and that is the Perak River Hydro-Electric Power Co. In this case all contracts for the supply of electrical equipment were let out in England before they commenced operations out here.

In this country one is continually hearing complaints laid against the service which local engineering firms give. The explanation is that such poor support is accorded local firms by Government and other public service departments that there is little or no incentive for these firms to spend money developing the electrical side of their business. When the departments require to purchase anything urgently and have no time to send the indent Home, they have no hesitation in turning round to local concerns, expecting to get such material from local stocks—material in most cases which is always obtained from Home direct. If Government and municipal departments have experienced staffs there does not seem to be a necessity for Home agents to enter into the subject at all.

G. B. PAGE.

Singapore.

Electrical Trade and the Crisis

I was pleased to see Mr. Wittick's letter commenting on my article in your issue of October 16th, as it is valuable to have the comments of those who are actually engaged in the furthering of British trade abroad. My article was only intended to deal with the principle of such appointments of B.E.A.M.A. representatives in foreign countries. The allocation of the cost could not be made by such simple arithmetic as Mr. Wittick employs. The total of the figure quoted was merely expressed as a percentage of the total export trade of Great Britain.

The duties of such a representative would not be connected directly with actual sales, but would be to augment the efforts made at present through existing channels and to take any action which would be in their joint interests. He would encourage co-operation among present agents, wherever this was considered desirable, but his success in this direction would depend on the general support accorded to him by the local agents themselves.

The success of the B.E.A.M.A. here has been brought about by the whole-hearted support which it has received from its members, and especially by the personal interest taken in its work by the heads of the industry.

I think that the duties of such a representative could be described as an effort to create a " Buy British " atmosphere and to do everything necessary to this desirable end. I would refer Mr. Wittick to my further article in your issue of November 6th, which deals in greater detail with the Argentine market, where the sale of domestic appliances is more fully treated.

Many of us would be glad to see the joint action mentioned by Mr. Wittick, but experience has shown the many difficulties in its way. The future may, however, see its development, but its realisation will be assisted better by a B.E.A.M.A. representative on the spot than by depending on the voluntary efforts of the manufacturers at home. H. C. SIDDELEY.

London, S.W.1, *December 2nd*, 1931.

Electric Clocks

I cannot think that " K. H." is serious when suggesting the use of a small petrol electric set for operating a system of impulse electric clocks. The current taken by such clocks is less than 1½ mA (constant flow), and I have never heard of a petrol-electric set of such microscopic proportions.

For remote situations a battery of good dry cells will suffice for runs of about three years without attention, which puts " K. H.'s " proposal in the shade as regards capital cost and maintenance.

Even remote situations are now being reached by the grid system. My firm supplies both mains and impulse clocks —also the latter type operated from the mains. Both have their uses and it must be remembered that flash lamps have a use even in buildings provided with electric light.

While I would advocate one or two frequency-operated clocks in a private house, I should hesitate to put a system of, say, fifty such clocks in, for instance, a large hospital, knowing full well that neither I nor the hospital authorities would have any control whatever over their running, and that the hospital engineer would be powerless if they all stopped on the current failing, to say nothing of the disturbing effect of having to enter all the wards with a ladder to set them to time when the current came on again.

There is, in my opinion, nothing to choose between high-speed and low-speed rotors so far as the user is concerned. I have had the opportunity of examining several of both of these types and find they are all designed with particular regard to their speed.

A superimposed current on the mains is feasible, and has had consideration in the case of d.c., but the problem is rather different in the case of a.c. You have a timed " ripple " already on a.c. mains, why not use it? A separate " ripple," if such were possible, would not overcome present difficulties, which frequently are not associated with the supply.

Two failures recently under my notice have been due to cable faults under the street, one of which took several hours and much digging to clear, and obviously in such cases the separate " ripple " would not be available.

ALFRED E. BALL, F.B.H.I.

Leicester, *December 7th*, 1931. (*Gent & Co., Ltd.*)

Winding Coils for Radio

As works foreman and engineer of a radio factory manufacturing mains units and other sets I should be interested in the views of other practical men on the merits of paper-wound compared with cotton interwoven coils. I have had many years of experience with cotton interwoven coils which can be more speedily wound than the paper type, but there still remains the problem of impregnation and drying off. These operations are somewhat lengthy and require careful and constant attention, as a careless operator may commit irreparable damage to a coil.

At the same time, when properly finished the cotton interwoven coil makes a solid job, being moisture proof and electrically sound, so far as test instruments can show. Here I would ask if spirit varnish has any deleterious effects upon enamel. If so, what are the best varnishes? Are manufacturers of enamel wire satisfied that their insulating enamel is as sound as silk or cotton, and, if so, why interleave with cotton or paper? With cotton-covered coils further interleaving would not be necessary.

In order to come to a decision as to which is the better coil an analysis of reports from the service and repair departments of radio manufacturers, covering a period of six months, would be very useful. Incidentally, such an analysis would, I believe, add considerably to the prestige of British radio, both at home and abroad.

Finally, it would be a considerable asset all round if an exchange of visits could be arranged by heads of departments, &c., to each others works, where methods of assembly, shop organisation and the elimination of wasteful methods could be seen and discussed. This would bring advantages to all concerned. G. JONES.

Salford, *December 3rd*, 1931.

Conditions in British Guiana

From time to time advertisements appear in the " Review," under the " Situations Vacant " section, relating to vacancies occuring in the Colonies and other countries abroad. The details given are necessarily brief, and intending applicants no doubt find, like myself, that reliable information concerning the general conditions in any particular locality is extremely difficult to get.

A recent instance is that of the position under the Sewage and Water Board of Georgetown, British Guiana, advertised in your issue of November 27th. At the salary offered it is, to me, an attractive appointment, providing that the cost of living in that town is not excessive. As regards climate, plenty of information is available, but I have so far failed to find any reliable source of data on the important point of cost of living in Georgetown relative to that in this country.

There are, no doubt, other readers of the " Review " who find the same difficulty regarding foreign appointments, and I think they would join me in thanking you for any suggestions you or your readers can make as to where such information can be obtained. QUERY.

December 5th, 1931.

Scientific and Technical Abstracts

A conference on scientific abstracting service was recently held at the Imperial College of Science and Technology at the invitation of Mr. H. T. Tizard, president of the Association of Special Libraries and Information Bureaux. The object of the meeting was to exchange experience and to discuss methods, in order to produce a body of information which could be utilised to mutual advantage. The Conference unanimously approved of collecting and reporting on the methods employed by societies and industrial undertakings for collecting and reviewing foreign publications. A small committee was appointed to issue a questionnaire to abstract organisations and information bureaux, and to summarise the replies. One of the main objects is to try to provide a more complete and prompt review of foreign scientific and technical publications, especially in the less understood languages, *e.g.*, Russian and Japanese. Copies of the questionnaire may be obtained from Mr. S. S. Bullock, secretary of the A.S.L.I.B., 16, Russell Square, W.C.1.

Faraday's Diary

Michael Faraday's famous diary, containing his notes on experimental investigations made during the years 1820-62, and bequeathed by him to the Royal Institution, is to be published. The work will include an index, or synopsis, and a foreword will be contributed by Sir William H. Bragg. The edition will be limited to 750 copies, the first volume to be published early in 1932 and the six others at intervals of two years; each will be illustrated with facsimile reproductions of Faraday's free-hand sketches and diagrams, the text being printed in full exactly as it was written. The work will be sold in sets only, at twelve guineas per set, by G. Bell & Sons, Ltd., York House, Portugal Street, London, W.C.2.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Steel-mill Controller

A controller for steel-mill service has been introduced by the IGRANIC ELECTRIC CO., LTD., 147, Queen Victoria Street, E.C., which employs time limit acceleration. The advantages claimed are that the starting resistor can be designed for the average load, and the acceleration adjusted accordingly, and that the motor is prevented from running on the resistor at less than full speed. The adoption of the inductive principle obviates the use of dashpots and sensitive devices.

A steel-mill motor controller

In the control panel illustrated the contactors are mounted on slate panels with an angle-iron frame. All main wiring is done with copper bars, and lugs are provided on the various switch studs for the external connections. The control panel is operated by a drum-type master switch, the contact fingers of which have drop-forged copper contact tips separated by moulded arc barriers. The drum cylinder consists of cast sections carrying renewable segments of rolled bar copper and bolted to an insulated square steel shaft. The drum can easily be withdrawn from the switch for inspection.

The accelerating contactor has, in addition to the usual shunt-closing coil, a shunt holding-out coil that acts on the tail-piece of the armature. Transient currents, for controlling the holding-out period of the successive accelerating contactors, are provided by the mutual inductance between the coils on a solid-core transformer on the control panel.

"Safety" Wall Plug

Prevention of accidental contact, and also of overheating and risk of fire arising from faulty contact when the plug is inserted, were the main points sought for by JULIUS SAX & CO., LTD., 27, Lower Mall, Hammersmith, W.6, in designing their new "Sax" wall plug. By virtue of the projecting shields at the socket surface and also at the cable entry of the plug it is impossible to insert the plug with a finger touching the pins. The hole in the socket tube is made the same size as the B.E.S.A. minimum size pin, and any variation is taken up by the makers' patent spring socket tube which makes a tight contact all the way up the inserted pins. The plug pin and terminal head are made in one solid piece. An economical feature is that two patterns only—flush or conduit and surface—suffice for all average requirements. Both patterns are constructed of stone-hard china (white or brown) having excellent insulating properties and being suitable for rough use. The flush pattern will fit the standard B.E.S.A. iron box.

"Sax" wall plug

Small Diesel Engines

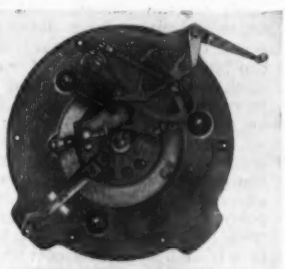
The latest addition to the ranges of "Atomic" Diesel engines manufactured by PETTERS, LTD., Westland Works, Yeovil, is on show at the Smithfield Club Show, Royal Agricultural Hall, London. It is of 7 b.h.p. and of very strong construction, embodying all the latest improvements. Ample provision is made for lubrication of all the working parts. The governor control is good, and the engine runs well at all loads with a regularity of motion unobtainable, it is claimed, with four-stroke cycle engines. It is recommended for the lighter grades of Diesel fuel oil, and is supplied without an underbase where required. It has already been adapted for use on portable tractors and locomotives.

The full-load fuel consumption is 0.5 lb. per b.h.p. hour. Starting is instantaneous by hand, no increase of working compression or any form of auxiliary starters being required. The speed is 650 r.p.m.

Another "Diesel" exhibit of interest is a three-cylinder high-speed 26½-b.h.p. unit on the stand of Messrs. RUSTON AND HORNSBY, LTD., Lincoln. This class of engine is also made as a four-cylinder unit rated at 35 b.h.p. The engine is of the four-cycle totally enclosed type, silent running, and well balanced. The design gives easy accessibility to all the main motion parts. It starts by hand from cold, an operation rendered easy by the use of a patented combustion chamber divided into two spherical portions. A special starting valve which can be operated by hand is arranged to shut off one portion of the chamber, thus effecting such an increase in the compression temperature that the fuel fires easily under the most severe atmospheric conditions. This engine is suitable for fuels such as paraffin, kerosene, distillate, gas oil, solar oil and most grades of Diesel-engine oil.

A Gramophone Motor

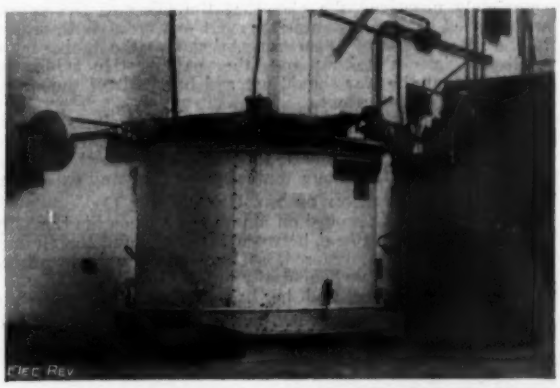
The "Magnet" gramophone induction motor just placed on the market by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has been designed to operate on a.c. mains at 100-125 and 200-250 V and from 40 to 60 cycles. It runs at turntable speed, *i.e.*, 78 r.p.m., without hum or noise, and under varying loads and voltages the speed remains constant. Lubrication of the main bearing is effected through an oiling hole in the turntable spindle, and as there are no brushes or other wearing parts requiring renewal the appliance generally requires very little attention. The fixing plate, turntable and switch are finished in bronze and therefore will tone with any surrounding woodwork. All metal parts can be earthed by a special terminal. Being supplied complete with a fixing plate, mounting the motor in almost any existing gramophone cabinet is a simple matter. Only one hole has to be cut in the motor board, and the fixing plate is screwed into position by screws provided. The equipment also includes a completely automatic starting and stopping switch designed to operate on any record with a run-off groove. Movement of the pick-up or tone-arm to the outer edge of the record switches the motor on, and it is automatically switched off without any previous setting. The switch also operates a brake which engages with the inside rim of the turntable.



Base of "Magnet" motor, showing automatic switch governor and speed regulator

Furnace with Charge Progress Recorder

A furnace recently introduced by WILD-BARFIELD ELECTRIC FURNACES, LTD., North Road, Holloway, N.7, is equipped for forced-air circulation, working in conjunction with the makers' charge progress recorder. The combination reduces the tempering of steel parts and the heat-treatment of articles made from aluminium alloys to almost an automatic process. The only manual work involved is in charging and unloading the furnace. Air is driven by a centrifugal fan over the heating elements and drawn down through the articles to be heated, which are usually placed in a perforated container made from non-scaling metal. The hot air is cooled in passing, and thermo-couples placed immediately below the material under treatment and in the air stream immediately it has left the heating elements show great difference of temperature as soon as the cold charge has been introduced. As the charge absorbs heat the difference becomes less, and when both thermo-couples record the same temperature uniformity of heating through the charge has been obtained, and the work is ready for removal. Incorporated with the equipment is the makers' patent charge progress recorder which not only records the temperature but also automatically controls it. In very nearly all low-temperature heat-treatment close control is of great importance. At 510 deg. C. the variation is only plus or minus 2 deg. C. Cyclic variation is equally important when dealing with this type of furnace, and that of the charge at 500 deg. C. is only 2 deg. C. The charge progress recorder is an instrument of robust construction, and of the type usually installed in hardening shops for ordinary temperature records.



Two 28-kW W-B furnaces with charge progress recorders

B.T.H.-Marconi Patent Applications

Electron discharge apparatus and rectifiers

IN the Chancery Division on December 3rd, Mr. Justice Luxmoore commenced the hearing of two applications by Marconi's Wireless Telegraph Co., Ltd., and the British Thomson-Houston Co., Ltd., for an extension for four years of two patents on the ground of loss of benefit due to the war. The patents were taken out in 1915. The first related to improvements in circuit connections of electron discharge apparatus and the second to improvements relating to means for obtaining unidirectional potential differences or current of constant value.

Mr. Trevor Watson, for the applicants, said the first patent had already expired and the second would expire this month. The applications were opposed by the Heseltine Corporation of America and Brown, Boveri et Cie., of Switzerland, on the grounds that the use of the inventions was dependent upon later developments which did not in fact occur until after the war; that any loss was due rather to the lack of exploitation of the patents than to circumstances arising out of the war; and that in the case of the second patent the British Thomson-Houston Co. neglected to apply for the patent in this country until 1920.

Counsel, in explaining what invention the first patent dealt with, said it was to enable the filament in the electron discharge device or thermionic valve to be lighted by means of alternating current without fluctuations of potentials. The purpose of the second invention was to permit of obtaining from an alternating current by means of a rectifier a current in which fluctuations of voltage and current were smoothed out. Both patents were capable of being used for other purposes than radio.

Counsel read evidence in support of the applications, and said that the fact emerged that both companies, because they were employed in war work, were unable to exploit the inventions during that time. With regard to the suggestions that these inventions were held back to await other inventions, that must be a matter of speculation, and he denied the allegation that radio development was deterred by the war.

APPLICANTS' EVIDENCE

Mr. John Gray, head of the patent department of the British Thomson-Houston Co., was called. Cross-examined by Sir Arthur Colefax and Sir Stafford Cripps on affidavits which he had made in support of the applications, witness said he agreed that for radio purposes the Marconi Co. acquired an exclusive licence from the General Electric Co. of America to exploit in this country all the latter's inventions, &c., for radio purposes, while the British Thomson-Houston Co. exploited them for non-radio purposes. The first use they made of the patent for smoothing apparatus was in 1925 in the manufacture of mercury arc rectifiers. The invention was communicated to the company in 1916 and the patent was applied for in 1920, the delay being due to war work.

Mr. W. H. Nottage, joint chief of Marconi's patent department, was called. In reply to cross-examination by Sir Arthur Colefax, he said with regard to the smoothing-out invention that it was only used for continuous-wave wireless transmitters, although it could be used for other purposes. The first transmitter of that kind was made by the Marconi Co. in 1914, and that was of an experimental nature. It had been commercially effective since 1921.

It emerged in the course of the case that the Marconi Co. had handed over its interests in the patents to the Gramophone Co., Ltd., and after discussion his Lordship said he would deal with that point later. He would see the agreement and then the parties would be in a position to say if the Gramophone Co. should be joined as applicant.

Mr. Tookey, for the applicants, submitted that there had been no opportunity during the war of developing the patents.

Sir Arthur Colefax, for Brown, Boveri et Cie., said his clients only opposed the patent No. 148,129 of 1915, and he was only concerned with the question arising out of the lateness of the filing of the application for the patent when the British Thomson-Houston Co. became possessed of the invention. In his view the British Thomson-Houston documents completely negatived the plea that the filing of the patent was delayed by circumstances they put forward. With regard to the plea of loss of opportunity, that was the fault of the applicants in not taking out the patent. He submitted definitely that the war should not add hundreds of thousands to the value of the patent.

The patent with which he was concerned had no possible value till 1928. His submission was that the applicants had not proved their case with regard to the patent counsel was concerned with, and that there was no ground for any extension.

THE POSITION OF THE GRAMOPHONE CO.

The hearing was resumed on Monday last when his Lordship inquired if the agreement between Marconi's and the Gramophone Co. had been secured, as he wished to know if the Gramophone Co. was beneficially interested in the case.

Sir Stafford Cripps said he had a copy but it was not necessary to disclose the contents of the document. It was an agreement for the sale of certain interests and it was quite clear that the Gramophone Co. was, in fact, the only interested party as exclusive licencee.

Mr. Watson said that there had been a conflict over the agreement. There was nothing to show that the Gramophone Co. was a necessary party.

His Lordship after reading the agreement said it appeared that the Gramophone Co. had some benefit in the extension of the patent and therefore ought to be a party. It would be sufficient to make them co-applicants, and that agreement could be read into the order. He would treat the matter as before him. He directed that an affidavit should be filed that no party should have a copy of the agreement.

Sir Stafford Cripps mentioned that there had been a combine embracing the Gramophone Co. known as Electrical and Musical Industries, Ltd. He then submitted his case. He said there was no doubt as to the first patent, there had been a period cut out, but that did not give a right to an extension. It had to be shown that the war stopped the development of the patent. But suppose there had been a change of fashion in regard to the public demand for a patented article some years after the war, it could not be said that the war had stopped the development of the patent. The Marconi Co. never had any interest in either of the patents during the war. It acquired its interest after the war by agreement with the Radio Corporation of America and then only became licensee.

With regard to the British Thomson-Houston Co. it had never been in the radio field except for the manufacture of a certain number of broadcasting receiving apparatus under licence from the Marconi Co. for a short time after broadcasting began. The purpose for which battery eliminators had been used had grown up since 1926, *viz.*, for broadcasting, "talkies" and gramophones. He therefore submitted that the applications ought to be dismissed.

Mr. Stafford Crossman, for the Comptroller of Patents, said he had been put in a difficulty because of an inaccuracy—no doubt unconsciously made—in the affidavit of Mr. John Gray, when the latter said: "I deny that the application for patent 148,129 was delayed for any reason other than pressure of war work."

His Lordship: Then when the matter was called to his attention he did not apparently look into the documents which he had. He could not have sworn that affidavit if he had looked at the file and seen what was in it.

Mr. Crossman said he did not suggest that Mr. Gray knew that it was not true, and he was only referring to the second patent.

Mr. Watson in reply submitted that Mr. Gray intended the Court to understand by his words that the staff was much depleted and could not attack all the work and that it was impossible to discriminate in looking through the documents.

JUDGMENT

His Lordship gave judgment on Tuesday. With regard to the patent for apparatus for obtaining unidirectional potential differences (No. 148,129), in his judgment there should have been a disclosure of the material facts in regard to it. There had been no disclosure. It must be obvious to anyone knowing the actual facts that, unless there was deliberate suppression of that paragraph of the affidavit, it was sworn without consideration of the facts contained in the file relating to the patent. He was satisfied that there was no dishonesty on Mr. Gray's part in the matter; but he could not acquit him of carelessness. He was satisfied that, in respect of this patent, there was no loss or damage caused by reason of the war. The conclusion his Lordship came to was that the application of the patent was not made, because, after consideration, it had been decided not to proceed with it.

There was carelessness in non-disclosure of material facts sufficient to compel his Lordship to decline the application in respect of patent 148,129, and he dismissed it. With regard to patent 15,448 (for electron discharge apparatus), the applicants had made out a *prima facie* case, and he would grant an extension of the patent for three years from November last.

Turbo Sets as Synchronous Condensers

The major portion of the Tokyo Electric Light Co.'s generating plant is hydro-electric, the power often being transmitted 100 miles or more. Steam plant is installed near the load centres to augment the supply, the period of low water for three months in the winter roughly corresponding to the period of heaviest load. The use of power plant so far from the load centre has made essential the installation of a large kVA capacity of synchronous condensers at the load stations; while a considerable amount of steam plant is shut down for a large part of the year, three 25,000-kVA steam turbo sets are brought into use as synchronous condensers, the generators being disconnected mechanically from the steam end.

An induction motor-generator set is used for starting up; it has a 2,500-h.p. motor, and the generator has a short time rating of 10,000 kVA and a continuous rating as a synchronous condenser of 7,500 kVA; the turbo-generator is tied electrically to the generator end of the set. The capacity of the starting generator must be at least one-third of the rating of the set to be started, and will bring the set up to speed in from three to five minutes.

Arcing Horns

Satisfactory protection afforded by causing the arc to leave the insulator and confine itself to the fittings

A FLASH-OVER is almost always the result of a sudden over-voltage of short duration which paves the way for a power arc at normal frequency maintained by normal voltage. An insulator should withstand a transient flash-over, but will invariably be damaged by the heat of a prolonged power arc over its surface. This risk can be obviated by providing for the arc an easy path sufficiently removed from the insulator. It can be said, very generally, that rain slightly increases the impulse and high-frequency flash-overs of both insulators and spark-gaps. It decreases the normal frequency flash-over of insulators, but may slightly increase that of the protective fittings.

Normal-frequency wet flash-over at 400 kV with B-type arrangement

Mist and Dirt

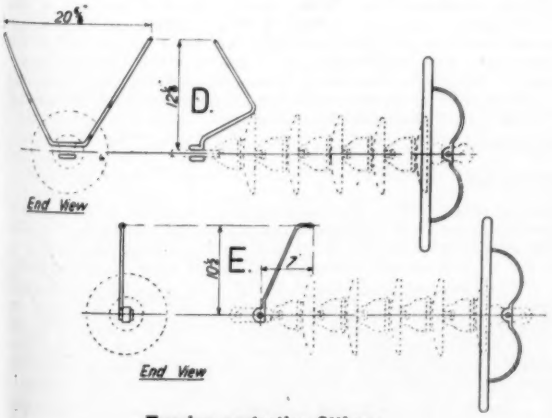
Mist or light rain on dirty insulators is a common condition in practice which greatly lowers the normal frequency flash-over of the insulators, and slightly reduces the impulse flash-over, but does not affect the high-frequency flash-over to any marked extent.

The impulse flash-over of the combinations of insulator and normally adjusted fittings is reduced by bad conditions to about the dry normal-frequency flash-over of the insulator strings; the high-frequency flash-over remains about that figure, while the normal-frequency flash-over is reduced, due to the soiling of insulators and field disturbance. It follows that protective fittings can be so adjusted that flash-overs occur, initially, across them under almost all conditions. The design of the fittings should be such that the arc is kept away from the insulators and quenched before the fittings are damaged or the supply interrupted. The gap lengths must be adjusted in relation to the insulators so that, with a low dry flash-over voltage, the wet and mist flash-over shall not be greatly reduced.

For Suspension Insulators

Of the three suspension protective arrangements illustrated, A and B are used by the Central Electricity Board on the Grid. Type A, which has been commonly used for some years, has the disadvantage that the arc is held at the end of the horn and may be blown back on the insulator string in variable winds; except in very heavy winds the arc cannot break of itself.

In types B and C, the arc must form in a sloping position. The convector currents of hot air cause the top of the arc to be led away from the insulators and up the arm of the horns,



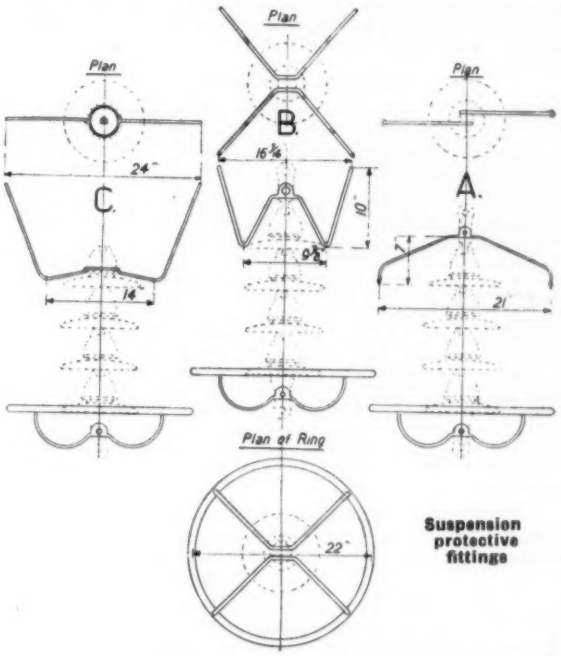
Tension protective fittings

and the bottom of the arc to become vertical. The arc is thus bowed out and breaks without assistance from the wind before the circuit breakers can operate and put the line out of commission.

Oscillograph records show that the double-W horn—type B—both keeps the arc away from the insulator and breaks it, and that type A holds the arc in such a way that it almost cannot be ruptured and does not keep it from the insulators. Type C is not so certain in action as B, because it is possible for the arc to remain on the cap at the top insulator without moving on to the horns.

Tension Fittings

The design of fittings for insulator strings in horizontal positions is of less importance than for vertical strings, because



Suspension protective fittings

in the former case the arc will travel up any shape of electrode away from the insulator, due to convector currents. The question becomes one of leading the arc off the particular fittings and breaking it as quickly as possible.

The horn illustrated as D, corresponding to the double-W in the suspension type, proved very satisfactory in a series of experiments. It was found that with the commonest kind of horns, bent to a point towards the ring, there was a marked tendency for the arc to stay on the tip.

The tests referred to above were carried out by Steatite and Porcelain Products, Ltd., at its research laboratories at Stourport.

The Brush-discharge Stimulant

Dr. E. P. Cumberbatch, the author of "Electricity in Healing" (ELECTRICAL REVIEW, November 27th), informs us of another method of using high-frequency currents for medical purposes, wherein the current is derived from a resonator of the Oudin or Tesla type. The difference of potential between the ends of the coil can attain a value high enough to allow the passage of sparks of six or more inches in length. An active electrode, made of a metal disc bearing a very large number of fine wire bristles, is connected to the free end of the coil. The other end is brought into connection with the subject under treatment. The active electrode is brought near the body but not close enough to allow the passage of sparks. A brush discharge, violet in colour, known as a *high-frequency effluve*, passes between the ends of the wire bristles and the skin.

This discharge is thermal rather than electrical; it is a form of "prickly heat." It stimulates the skin and the numerous end-organs of the sensory nerves that lie below the epithelium, and this influences the function of the organs of the body. There is evidence to show that the internal secretion of some of the endocrine glands (such as the thyroid, pituitary, adrenal) can be influenced by stimulating the skin, which is an organ of great importance and not a mere covering of the body. All the internal organs of the body are represented, as it were, by nerve endings within it, and it is possible that the skin may produce an internal secretion of its own with special properties.

The high-frequency effluve does not produce any striking results, and the cynic might remark that a mustard plaster would be just as good, and much less expensive. The generator of the effluve, however, is housed in the electrical departments of hospitals and institutes, places to which the cases drift, like derelicts, after other forms of treatment have been tried in vain.

South African Electricity Commission

THE Electricity Supply Commission of South Africa has recently published its eighth annual report, covering its operations for the year ended December 31st last, together with a brief review of its activities up to April 30th, 1931.

In spite of the world-wide depression which made itself felt in South Africa during the past year, the report states that the increases in the electrical output of the country made in recent years were, on the whole, maintained. So far as the Commission's undertakings were concerned, there was an increase during 1930 in the total output, and the sales to each class of consumer, with the single exception of supplies for railway traction purposes, which reflects the decreased volume of railway traffic. Increased sales to other classes of consumers have, however, more than offset the decline in railway traction supplies.

Satisfactory Expansion

The output of most other electricity undertakings in South Africa, both municipal and private, continues to expand, and the extent of the development is exemplified in the comparatively large number of extensions in progress and under consideration at the present time. During 1930 the electricity extension schemes of urban local authorities reported upon by the Commission involved an estimated total capital expenditure of over £750,000.

It is abundantly evident that the recognition of the advantages of electricity as a medium for the variety of purposes to which it is adaptable, in both the domestic and industrial spheres, is spreading, and it is to be anticipated that the progressive increase in the demand thus created will continue. In fact, it may be said that, with one or two notable exceptions, the market for electricity supply in South Africa is only just being opened up. Active consideration was given to the formation in Southern Africa of an Electrical Development Association on the lines of similar associations in overseas countries, where the movement has been markedly successful, and an organising committee, upon which the Commission was represented, was formed.

The Commission has under its control five undertakings—Natal Central (60,000 kW), Witbank (100,000 kW), Capetown (30,000 kW), Durban (36,000 kW), and Sabie (1,350 kW). An additional 12,000-kW generating set is in course of installation at the Congella (Durban) station.

Financial Results

The total revenue from the undertakings amounted in 1930 to £1,005,795, of which £454,995 was derived from bulk supplies and £399,583 from traction supplies. The two largest bulk supply consumers—accounting for nearly 90 per cent. of the revenue under this heading—are the Victoria Falls and Transvaal Power Co., Ltd., and Durban Corporation. Production costs totalled £1,002,271, made up as follows:—Generation, £324,045; distribution, £38,602; general expenses, £93,966; interest and redemption, £450,694; reserve fund, £94,964. The net surplus amounted to £3,524. The total capital expenditure of the Commission at the end of the year was £8,083,558.

Sales of electricity during the year 1930 reached a total of 889,611,924 kWh, representing an increase of 92,613,573 kWh, or approximately 11.6 per cent. as compared with 1929. Bulk supplies accounted for 701,285,627 kWh, traction for 129,791,764 kWh, and industrial and mining supplies for 57,525,363 kWh, the remainder (1,009,170 kWh) being consumed by domestic and lighting consumers. The average cost per kWh sold was 0.270d., as compared with 0.298d. in 1929.

During the year there was an increase of 641 in the number of consumers, bringing the total connected at December 31st to 1,658. The total area supplied is now approximately 11,000 sq. miles.

A trial is at present being given to the employment of white labour, in place of native, in certain classes of unskilled power station work. It is hoped that, as a result of this experiment, it may be found practicable to extend the use of white labour on the Commission's undertakings, and that with the opportunities afforded them, the men will qualify for promotion to more responsible work.

Indian Electrical Notes

FROM OUR INDIAN CORRESPONDENT

Retrenchment All Round

THE report of the Retrenchment Advisory Committee of the Indian Posts and Telegraphs Department recommends a considerable curtailment in telegraphic facilities and telegraph departmental staff. A large number of the higher posts in the engineering branch will be abolished, while a minimum of telegraph stores will be kept. The telegraphic workshop at Alipore (Calcutta) is to be reorganised on a reduced scale. This workshop manufactures all the construction stores used by the Department, except wire and insulators. In addition, it makes a considerable quantity of telegraph and telephone apparatus and power switchboards, and carries out all repairs to telephone and telegraph equipment.

The Position in Madras

The Retrenchment Committee in Madras, after consulting Major Howard, the chief engineer for Hydro-Electric Development, agreed with him that the five years' programme which will end next year should be worked out in full. The Government will then be equipped with a number of complete schemes which can be carried out as funds permit, and that further expenditure on investigation should be limited to the work on hydrometic survey. At present the Government is engaged on a scheme for amalgamating under a single head all the electrical activities now performed by the Hydro-Electric Department, the electrical inspector and the electrical engineer. The Committee is further considering the scales of fees which should be charged for consultative work, and for carrying out inspections.

Electrical Progress in Mysore

With the completion of the seventh installation at Sivasmudram, the total generating capacity of this station is 46,000 h.p. The power actually generated in the past year was 170 million kWh, against 166 million kWh in the previous year. Energy was supplied during the year to 436 new power consumers, and to 1,650 new lighting installations. The transmission line from Bangalore to the new water supply works at Thippe was completed, and extended to Chennapatna, *via* Closepet.

Progress in Rural Areas

At the end of last year there were 250 irrigation pumps in service, while applications for pumping installations are increasing daily. For popularising the use of power pumps the rate for supply of energy has been reduced from 1½ to 1 anna per kWh.

Future of Broadcasting

The deputation which waited upon the Member of the Government of India for Industries and Labour has returned with some hope for broadcasting. The service was in any case to be continued till the end of November, by which time a definite statement was to be made. As the decision of the Government will depend upon public support, an appeal has been issued to the public and to the trade in general to co-operate so that broadcasting may not be a loss to the Government. It is urged that there should be absolutely no "piracy" in connection with licence fees, and that all persons should renew their licences at once.

Books Received

"Manual of Electrical Undertaking and Directory of Officials, 1930-31." ("Garcke's Manual.") Pp. cxlvi+2030. London: Electrical Press, Ltd. Price 35s. net. The 34th annual addition of this familiar work of reference contains the usual fund of information regarding over 5,500 electricity undertakings in the British Isles, the Dominions and British possessions throughout the world. It also includes a directory containing the names and addresses of 16,000 directors and officials and a list of electrical companies registered during the period June, 1930, to June, 1931. All information has been revised to September, 1931, while the working accounts are the latest available, covering in the majority of cases the year 1930-31.

"The Wireless and Gramophone Trader Year Book and Diary, 1932." Pp. 368. London: The Trader Publishing Co., Ltd. Price 5s. 6d. post free (3s. 6d. post free to subscribers to "Trader" journals).—A feature of the new edition is an article entitled "Practical Service Methods," which deals with the broad principles involved in service work the dealer is normally called upon to perform. All the wireless and gramophone technical data and broadcasting information have been revised to date and are presented in a new form providing more convenient references. The trade directory portions include lists of manufacturers, manufacturer's agents, and wholesale factors, with their addresses and telephone numbers, and also the proprietary names of wireless and gramophone goods. A seven page directory of supply voltages is a useful innovation.

"The Sweden Year Book, 1931." Pp. iv+317; illustrated. Stockholm: Almqvist and Wiksells Co., Ltd.—Printed in English, this book forms a standard work of reference for all interested in Sweden. In addition to describing life and conditions in the country the book includes chapters on industrial and economic matters, foreign trade, and other information.

"Radio Telegraphy and Telephony," by R. L. Duncan and C. E. Drew. Second edition, revised and enlarged. Pp. xi+1046; figs. 527. Chapman and Hall, Ltd. Price 45s.

"Converting a Business into a Private Company," by Herbert W. Jordan. Ninth edition. Pp. 50. London: Jordan and Sons, Ltd. Price 1s. 6d.

"Die Reichselektrowerke" ("The State Electricity Works"), by Dr. Ernst Heissmann. Pp. 75, with graphs and tables. Berlin: Verlag R. & H. Hoppenstedt. Price 7 Rm.

"Des Ingenieurs Taschenbuch." Akademischen Verein Hütter. Vol. II. Pp. xx+1196; illustrated. Berlin: Wilhelm Ernst and Lohn. Price, linen Rm. 17.50, leather Rm. 20.50.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Inquiry for Presspahn Bobbins

The Department of Overseas Trade has received an inquiry for the names of United Kingdom firms who are at present manufacturing, or who are prepared to consider the manufacture of, the smaller sizes of presspahn bobbins, as used in the electrical instrument and radio industries. Supplies have hitherto been obtained from Continental sources. Firms interested can obtain samples of the bobbins required on application to the Department, Room 50a, 35, Old Queen Street, London, S.W.1.

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting :—

Plater, A. S., & Co., Wood Green, N.22.
Couzens, T., & Sons, Ltd., West Marden, nr. Chichester.
Bevis, Frank, Ltd., Portsmouth.
Pickford, J. C., Irlams o' th' Height, nr. Manchester.
Universal Lighting Co., Ltd., Clacton-on-Sea.
Jones, G. D., Chester.
Chesham & District Electrical Installation Co., Ltd.
Biker, R. P., Hastings.
Lakeman, B., Chester.
Thorpe & Thorpe, Ltd., London, S.W.1.

At the same meeting twelve applications were declined.

Northern E.D.A. Activities

Performances of " Lumens at Law," a mock trial, were given at the Connaught Hall, Blackett Street, Newcastle-on-Tyne, by the Northern Counties branch of the Electrical Development Association and the Electrical Association for Women on December 2nd and 3rd. The play, which is designed to emphasise the importance of good lighting to industry, was most successful and the hall was packed to capacity on both nights, over 800 people witnessing the show.

The fourth E.D.A. Electrical Carnival, which is to be held in Newcastle on January 8th, promises to be even brighter than in previous years. Already the committee has received a very large number of excellent prizes from the industry and many novel schemes are being arranged. The proceeds are again in aid of the E.T.B.I. and the I.E.E. Benevolent Fund, and the guests will be received by Mr. and Mrs. A. C. Cramb. Tickets (5s. each) may be obtained from the Secretary, Mr. A. Parkin, E.D.A. Area Office, Newcastle-on-Tyne.

New " Easiwork " Showrooms

Extensive new and well-arranged showrooms were opened last week by Easiwork, Ltd., at 242, Tottenham Court Road, W.1. All the decorations in the building have been carried out in the most modern style, glass and chromium steel being employed to a large extent with a very neat and pleasing effect. In the cabinet showroom a lighting system employing tubular lamps has been installed, while a form of indirect lighting provides the illumination in the lecture hall, where demonstrations of up-to-date cooking appliances will be held regularly. Loud-speakers have been installed on all the floors and it is proposed to " broadcast " gramophone music throughout the building. In addition to a number of ultra-modern lighting fittings the showrooms contain examples of electric dish-washing, washing and ironing machines, mixers and other labour-saving devices.

Correction

With reference to the note entitled " New Radio Factory at Willesden " which appeared on p. 854 of our last issue, it was stated that the Zetavox Radio and Television Co., Ltd., would shortly commence the manufacture of " Zenith " radio receivers, and that Messrs Kenneth Brooks, Ltd., were the present distributors of " Zenith " apparatus. These statements, we now learn, were incorrect. The apparatus to be made by the Zetavox Co. will be under the trade mark, *Zetavox*. Messrs. Kenneth Brooks do not claim to be distributors of " Zenith " apparatus and they recently gave an undertaking to the Zenith Electric Co., Ltd., Villiers Road, Willesden Green, N.W.2, to refrain from the use of the trade mark " Zenith."

Worthing and Electrical Contractors

The Worthing Town Council, in General Purposes Committee, recently discussed a report from the Electricity Committee as to the running of the new municipal showrooms in Chapel Road, which are expected to be ready for occupation in the course of the next fortnight. The report stated that the Committee had received a deputation representing the electrical contractors of the town who desired to arrange a suitable basis of co-operation with the Corporation in the management of the showrooms, the suggested basis being that no apparatus should be sold direct to the public by the Corporation, but that all sales should be effected through or on behalf of the contractors who would pay the Corporation a commission of 7½ per cent. on the business done. The contractors were also willing to provide the new showrooms with stock to the value of £2,500. The Committee pointed out that these proposals would not give the Corporation sufficient revenue to meet the expenditure in connection with the showrooms, the suggested commission on an estimated annual turnover of £5,000 being less than the rent of the premises, and in reaffirming its decision to use the showrooms for all the purposes authorised it also recommended an expenditure of approximately £1,000 for the purchase of stock and various appointments for the staffing of the new premises. Mr. Wigan, the present consumers' engineer, it was proposed should act as manager, and the other appointments included a head salesman at a salary of £185 a year, and a lady demonstrator at a salary of £145 a year. These recommendations were eventually adopted.

Recent Contracts

Standard Telephones & Cables, Ltd., has received an order from the General Post Office for transmission testing apparatus for the London repeater station, and a contract from the French Administration for a voice frequency carrier terminal for the Paris-Geneva circuit. Important orders received by the company from abroad for repeater equipment are from the Italian Administration for eight repeater stations for the South Italian cable scheme, and from the Southern Rhodesian Government for cord circuit repeaters and test sets for Bulawayo.

A contract has been awarded the Westinghouse Brake and Saxby Signal Co., Ltd., by the London & North-Eastern Railway Co., for the supply and erection at the Down Marshalling Yard, Whitemoor, of two eddy-current rail brakes, together with the power plant and control equipment.

The Admiralty has placed two further contracts with Siemens Electric Lamps and Supplies, Ltd., for internally frosted lamps.

The British Thomson-Houston Co., Ltd., has secured from the Southern Railway an order for a large quantity of " Mazda " gasfilled lamps.

Opposition to Crook Showroom Proposal

Considerable opposition was offered at the last meeting of the Crook Urban District Council to a proposal to open an electricity showroom, Mr. J. Dickinson saying he was very pleased to learn that the electrical engineer thought it would not be a financially profitable concern. Mr. F. Waddington, who took the other view, contended that the only way to ensure lower costs of electricity was to advertise the service, and that a showroom was an effective form of advertising. The subject was ultimately referred to the next meeting.

A New Marconi Development

The Marconi International Marine Communication Co., Ltd., has formed a new department to be known as the Electrical Service Department, which will undertake the inspection, maintenance and repair of all shipboard electrical equipment. An agreement has already been concluded with Messrs. Alfred Holt & Co., the Liverpool shipowners under which the new department will take over all the electrical and wireless maintenance work of the eighty ships running under the Alfred Holt flag as from the beginning of next year. This contract includes the inspection, maintenance, and repair of all the wireless telegraph equipment.

" Buy British " Exhibition at Aylesbury

" Buy British Always, but Local Productions First," is the war-cry adopted by the Aylesbury Electricity Department in connection with its " Buy British " campaign. In the Aylesbury rural area there are many old industries now converted to electricity, and to assist these and to substantiate its slogan the Department recently held an exhibition of local productions. The principal exhibits were electric fires, and carved wood and forged metal lighting fittings.

New Municipal Showrooms

The Aldershot Town Council has decided to proceed with a scheme costing £5,000 for the conversion of premises in Victoria Road for use as electricity showrooms.

Electricity showrooms are also to be provided by the Dartford Urban District Council Electricity Committee in High Street, Dartford.

An Income-tax Payment Scheme

The directors of Messrs. Falk, Stadelmann & Co., Ltd., have prepared a scheme for advancing to members of their staff who are in receipt of salaries not exceeding £750 per annum the amount of their income tax due in the New Year. Repayment will be accepted in 24 weekly or six monthly instalments, no charge being made to the employé for the accommodation.

Floodlighting at Lincoln

A floodlighting installation carried out by the Revo Electric Co., Ltd., at the Usher Galleries, Lincoln, is remarkable for the evenness of illumination. Floodlights are fixed on the ground level, approximately 27 ft. away from the building. Eight projectors employing 500-W lamps are trained on the top part of the building, while six, using 300-W lamps, illuminate the lower portion. The fittings are arranged in pairs, one for high and the other for low level. Two further floodlights are placed 600 ft. away, and are used for illuminating the minarets over the central doorway.

The Electrical Trade of Peru

Mr. W. M. Gurney, Commercial Secretary to H.M. Legation at Lima, has prepared a report for the Department of Overseas Trade on the Economic Conditions in Peru (H.M. Stationery Office, 2s. 6d. net). This shows that the value of imports under the heading of "Electrical Articles and Apparatus" (light weight) for 1928 and 1929 was £P321,000 and £P471,000 respectively, the British share rising from 10 to 13 per cent.

American Exports of Vacuum Cleaners and Irons

The exports of electric vacuum cleaners from the United States during the nine months ended with September last attained a value of £175,510 as compared with £264,080 in the corresponding nine months of 1930. During the same period the exports of electric irons also declined from £43,990 to £31,120.

New French Companies

Among the new companies recently formed in France are the Société Hydro-electrique des Vosges, Mulhouse, capital £240,000, to establish hydro-electric plants in the Vosges to utilise the water power of two lakes known as Lac Blanc and Lac Noir; La Société Francaise pour le Developpement de l'Electricité "Safradel," Paris (7 Rue Geoffroy Marie); and La Société d'Electrification Industrielle, Chaville, Seine-et-Oise (16, Avenue Curie).

The Bulgarian Woodworking Machinery Market

A Department of Overseas Trade report on trade in Bulgaria says that it would be possible to introduce British-made saw-mill and wood-working machinery provided that prices and terms were competitive. It would be difficult to introduce goods of higher price even though the quality were correspondingly better. The Swedes and Germans have set the prices and terms for this market, but if there are any British manufacturers able to provide a competitive range, on receipt of catalogues and prices an attempt will be made to interest local dealers.

Trade Announcements

The Weston Electrical Instrument Co., Ltd., has now completed its new offices and works in the Kingston By-Pass and is commencing its policy of manufacturing instruments at its own plant. The present laboratory is being re-instated at the new works and the manufacturing departments are to be organised for the complete production of the company's instruments. The new address of the company is Kingston By-Pass, Surbiton, Surrey. Telephone: Elmbridge 6400 and 6401. Telegrams: Pivoted, Surbiton.

Messrs. Thomas & Owen, electrical contractors and radio dealers, have opened premises in Post Office Lane, Merthyr Tydfil.

Messrs. G. P. Cosway, Ltd., have appointed Mr. H. B. Whitmore, of Bramhall Lane, Stockport, agent for their "Dred-Nort" link disconnecting box and mains requisites.

The telephone number of the new Nottingham stores of Messrs. W. T. Henley's Telegraph Works Co., Ltd., is Nottingham 44970 and not as stated in our issue of November 13th.

Messrs. R. H. and J. Pearson (Eastbourne), Ltd., electricians, have opened new showroom premises at 15, Cornfield Road, Eastbourne.

Change of Name

Owing to the extension of its business to include not only the Howden-Ljungstrom air preheater but also other boiler-house and power-station auxiliaries such as mechanical draught fans, furnace fronts, high-speed engines and dust collectors, the Howden-Ljungstrom Preheaters (Land), Ltd., has decided to change its name to "James Howden & Co. (Land), Ltd."

A Motor Brake Chart

Messrs. Marryat & Scott, Ltd., have sent us a copy of a chart which they have evolved, by means of which the correct size of brake for motors of any h.p., ranging from 60 to 3,000 r.p.m., can be readily ascertained. This should prove of service in a number of directions.

Swansea Docks

The article by Mr. B. C. Williams in our issue of November 27th, bearing the above title, omitted to mention that among the crane equipment at the docks are fourteen electric travelling portal jib cranes, all of 3-ton capacity, supplied by Messrs. Stothert & Pitt, Ltd. Eight of these were installed in 1928 and the remainder this year.

Social Events

Over 200 guests were present at the annual dance and whist drive of the Lancashire Electric Power Co., which was recently held in the Plaza Ballroom, Manchester. In addition to the company's staff, representatives of a number of local electricity undertakings attended the function.

The Social and Sports Club of the Sun Electrical Co., Ltd., held its first concert at the Sampson Clark Hall, Mortimer Street, W.1, on December 2nd. The programme included vocal and instrumental items and a series of humorous short sketches. The whole of the programme was carried out by the staff.

The Manufacturers' Agents' Association of Great Britain and Ireland (Inc.), recently held a whist drive and social at Anderton's Hotel, Fleet Street, E.C., about 85 members and friends being present. The next social function will take place in March.

Duke of York at Lister's Works

The Duke of York, accompanied by Mr. R. R. Hyde, director of the Industrial Welfare Society, visited the works of Messrs. R. A. Lister & Co., Ltd., at Dursley, on December 3rd.

Calendars and Diaries

Views of the works and its associated companies on monthly sheets form the calendar of the Associated Machine Tool Makers, Ltd.

The North Metropolitan Electric Power Supply Co. enhances its reputation for attractive calendars by a picture of a charming auburn-haired damsel.

A reproduction of a water-colour, "Miller's Dale, near Bakewell," is the subject of the D.P. Battery Co.'s calendar.

New Year Holidays

Messrs. Bruce Peebles & Co., Ltd., announce that their works will be closed from December 31st till January 6th inclusive and their head office on January 1st.

For Sale

Salford Electricity Department has a rotary convertor for disposal.

(See our advertisement pages to-day.)

Czecho-Slovakian Electrical Imports

During October last Czecho-Slovakia imported electrical machinery and apparatus to the value of 32,241,000 crowns, making the total for the first ten months of the year 225,698,000 crowns. The figures for the corresponding periods of 1930 were 31,000,000 crowns and 254,000,000 crowns respectively.

Trading With Algeria

A confidential memorandum (Ref. No. C.X.3717) regarding the methods of quoting and terms of payment in Algeria prepared by H.M. Consul-General at Algiers has been received and issued by the Department of Overseas Trade to firms whose names are entered on its Special Register.

Swedish Enterprise in Jugo-Slavia

It is reported from Zagreb that the Swedish Ericsson Telephone Co. has established a branch company in Belgrade to deal in all kinds of electro-mechanical products, &c.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, Etc.	Price Dec. 9th.	Fortnight's Inc. or Dec.
a	Acid, Oxalic .. .. per lb.	5½d.	—
a	Ammoniac, Sal .. .. per ton	£60	—
a	Ammonia, Muriate (large crystal) .. ,,	£52	—
a	Borax .. .. ,,	£17	—
a	Copper Sulphate .. .. .. ,,	£25 10s.	—
a	Potash, Chlorate .. .. .. per lb.	3d. to 4d.	—
a	,, Perchlorate .. .. .. ,,	5½d.	—
a	Shellac T.N. .. .. per cwt.	£4 5s.	—
a	Sulphur Commercial .. .. .. ,,	£11	—
a	,, Roll .. .. ,,	£11	—
a	Soda, Chlorate .. .. per lb.	3d.	—
a	,, Crystals .. .. .. per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks .. .. per lb.	3½d.	—
	METALS, Etc.		
b	Aluminium, Ingots .. .. .. per ton	£95 to £100	—
b	,, Wire .. .. .. per lb.	1/1 to 1/9	—
b	,, Sheet and Foil .. .. ,,	1/1 to 2/9	—
b	Babbits Metal and Anti-friction Metals—		
	Grade I .. .. .. per ton net	£132	£3 inc.
	Grade II .. .. ,,	£94	£2 inc.
	Grade III .. .. ,,	£54	£2 inc.
c	Brass (rolled metal 2" to 12" basis) .. per lb.	7¾d.	¼d. inc.
c	,, Tubes (solid drawn) .. .. ,,	10d. to 10¼d.	¼d. inc.
c	,, Wire, basis .. .. .. ,,	8¼d.	¼d. inc.
c	Copper Tubes (solid drawn) .. .. ,,	11d.	¼d. inc.
g	,, Bars (best selected) .. .. per ton	£75	£5 inc.
g	,, Sheet .. .. ,,	£75	
g	,, Rod .. .. ,,	£75	
d	,, (Electrolytic) Bars .. .. ,,	nom.	—
d	,, ,, Sheets .. .. ,,	nom.	—
d	,, ,, Wire Rods .. ,,	nom.	—
d	,, ,, H.C. Wire .. per lb.	7 7/8d.	¼d. inc.
f	Ebonite Rod .. .. ,,	1/3 to 1/6	—
f	,, Sheet .. .. ,,	1/3 to 1/6	—
m	German Silver Wire .. .. .. ,,	2/2	—
h	Gutta-percha, fine .. .. .. ,,	nom.	—
h	India-rubber, Para fine .. .. ,,	3¾d.	¼d. inc.
i	Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
l	,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g	Lead, English pig .. .. .. ,,	£17	15s. inc.
g	Mercury .. .. per bot.	£20 10s. to £21	£3 to £3 5s. inc
e	Mica (in original cases) small .. per lb.	6d. to 3/6	—
e	,, ,, medium .. ,,	4/- to 8/-	—
e	,, ,, large .. ,,	8/6 to 17/6 & up	—
p	Phosphor Bronze, plain castings .. ,,	1/1½d.	—
p	,, ,, drawn bars & rods ,,	11¼d.	¼d. inc.
p	,, ,, rolled strip & sheet ,,	11¼d.	¼d. inc.
p	,, ,, wire .. .. .. ,,	1s. 0¾d.	¼d. inc.
o	Platinum .. .. per oz.	£11 13s. 6d.	£1 5s. inc.
d	Silicium Bronze Wire .. .. .. per lb.	8¾d.	¼d. inc.
r	Steel, magnet, in bars .. .. ,,	7½d.	—
g	Tin, Block (English) .. .. .. per ton	£139 15s. to £141 15s.	£2 15s. inc.
n	,, Wire, Nos. 1 to 16 .. .. per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Another Electrically Propelled Ship Ordered

An order for a repeat of the *Monarch of Bermuda* (ELECTRICAL REVIEW, March 27th, 1931, p. 547) has recently been placed with Messrs. Vickers-Armstrongs, Ltd., by Messrs. Furness, Withy & Co., Ltd. The ship will be built at the former company's Barrow works, where the *Strathnaver* and the *Strathaird* (ELECTRICAL REVIEW, October 2nd, 1931, p. 497) were also completed recently for the P. & O. company. Employment will be provided at Barrow for an average of at least 2,000 men for fifteen months, and, in addition, there will be large numbers of people employed in executing the main propelling machinery—which will be provided by the General Electric Co., Ltd.—and in the manufacture of the various auxiliary machinery, furnishings, &c.

Petition for Receiver for R.K.O.

It is reported from New York that a petition has been filed in Baltimore for the appointment of a receiver for the Radio-Keith-Orpheum Corporation, in which the Radio Corporation of America has a large interest. The petition has been presented by Mr. J. Cookman Boyd, who alleges that there has been reckless expenditure, placing the company in a situation in which its assets may be dissipated unless timely action is taken.

Turkish Import Restrictions

Import restrictions have been imposed by the Turkish Government on certain goods. According to the *Board of Trade Journal* the following quotas have been fixed for December for electric motors, dynamos, transformers, commutators, resistances, coils, magnetos, sparking plugs, convertors, distributors, ventilators, vacuum cleaners and the like (mounted or not), the whole weighing:—(a) Up to 10 kilog, 2,812 kilogs; (b) 10 to 50 kilogs, 16,071 kilogs; (c) 50 to 1,000 kilogs, 15,790 kilogs; (d) 1,000 to 2,000 kilogs, 11,342 kilogs; (e) 2,000 to 5,000 kilogs, 2,003 kilogs.; (f) over 5,000 kilogs, 99,658 kilogs.

An All-electric House at Sheffield

The Sheffield Electricity Department has recently opened an all-electric house at Ecclesall. "Mazda" lamps are used throughout for the interior lighting, and the floodlighting projectors for exterior night lighting are also fitted with "Mazda" lamps. The electrical installation was carried out by R. P. Ratcliff & Co., of Sheffield.

A Swimming Bath Lighting Installation

The scope that swimming baths offer for attractive and efficient illumination is amply demonstrated by a lighting system recently installed by Messrs. Barlow Bros. & Co., at Messrs. Bourne & Hollingsworth's staff residence, Gower Street, E.C. The outstanding feature of the installation is the number of different methods of illumination employed, and it will be seen from our illustrations how satisfactory the result is. Above the balcony is a system of continuous trough lighting employing 260 20-W lamps, while under the balcony separate troughs are fitted, having in all 230 20-W lamps. On the trusses spanning the baths are two further sources of illumination coming from 56 100-W lamps. In addition there is at each end a roof lantern containing four 150-W lamps, while in the lounge outside the changing rooms and shower baths there are three ceiling lanterns each containing two 150-W lamps.

Blue tiles line the bath itself, and a very striking effect is obtained from eight 500-W "daylight" lamps fixed at intervals along the edges under the water. For operating the ventilating installation (carried out by Messrs. G. N. Haden and Sons, Ltd.) and the purifying plant, there are five Verity motors. Glover's cables and Crabtree switches are used throughout the building, the lamps being "Osram" and Philips'. The architects were Messrs. Slater and Moberly.

New Gramophone Recording Studio

The accompanying illustration shows a new recording studio which the Gramophone Co., Ltd., has recently completed. It is 130 ft. long, 50 ft. wide and 30 ft. high, while the platform accommodates 250 musicians and the auditorium 1,000 people.

A view of the new H.M.V. Studio

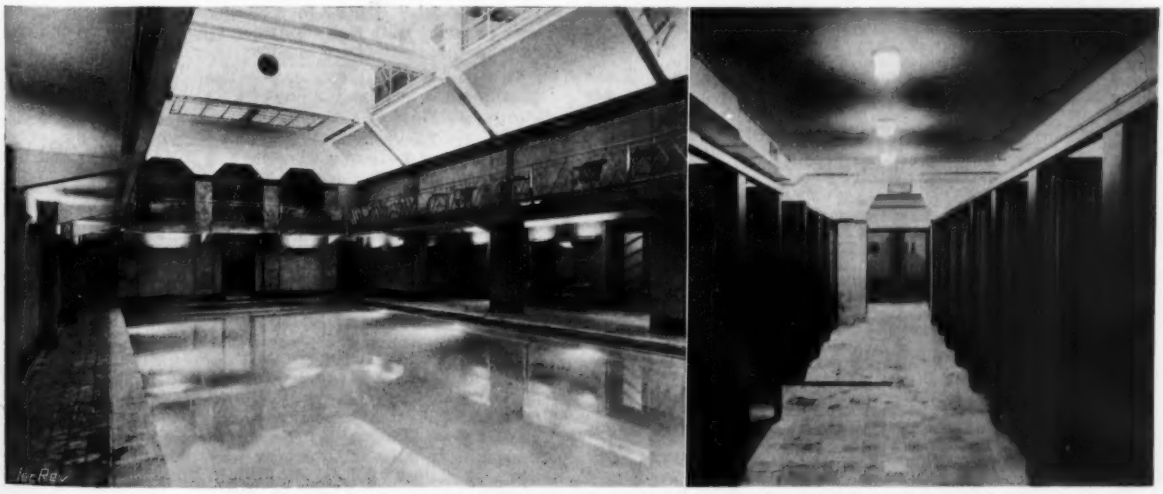
The walls are specially designed to give correct resonance to all sounds and to avoid any echo. A special system of air cleaning and ventilation has been installed and the lighting is solely by artificial means employing twelve "Holophane Hedralite" octagonal drum fittings.

The American Electrical Industry

Statistics published in the November issue of the "Survey" of the National Electrical Manufacturing Association (U.S.A.) relating to the output of certain of its members during September and August give no indication of any improvement in trading conditions. For the two months mentioned orders for a.c. motors (1-200 h.p.) with control equipment at $3,166,817 were $1,831,647 lower than in the corresponding period of last year, d.c. motors also declining from $1,540,290 to $712,945. Fractional h.p. motors were not quite so badly affected, orders falling only 22 per cent. to $3,219,195. Exceptionally large decreases were recorded in power switching equipment, indoor apparatus amounting to only $89,293 (as against $240,361) and outdoor apparatus to $363,672 ($618,022). Electric furnaces still continue the worst feature of the market, the value of this class of apparatus declining from $150,133 to $59,785.

French Cable Company Winding Up

According to the *Financial Times* one of the most important French cable and copper wire manufacturing enterprises, Société l'Electro Cable, having a total issued share and debenture capital of over 222,000,000 fr. (£2,600,000) and numerous ramifications in France, Belgium and Spain, including electrical construction and other engineering companies, is to be wound up. Protracted negotiations with American and Belgian industrial interests (including the Anaconda Cable and Wire Company and Union Minière du Haut Katanga) have broken down. Owing to the ill-success of the reconstruction project the banking creditors have refused to renew advances due at the end of last month. Liabilities—and assets—are estimated at 840,000,000 fr. (equal to nearly £10,000,000 at the present rate of exchange). For various reasons the breaking-up value of the assets is believed to fall considerably short of the above estimate.



The swimming bath and changing rooms at Messrs. Bourne & Hollingsworth's staff residence

New Catalogues and Lists

Holophane, Ltd., Elverton Street, Vincent Square, S.W.1.—A brochure on prismatic bulkhead and enclosed industrial fittings.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A circular suggesting that the fall in the value of the £ makes the present time opportune for increasing stocks of standard "Henley" products.

Wright (Electric Power Specialities), Ltd., Century Works, Halifax.—A list of small power single-phase repulsion induction motors.

Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gardens, Victoria, S.W.1.—Publications B.18 and 20, dealing respectively with closed top type cells and "Safetylyte" equipment for emergency lighting.

Henry Wiggin & Co., Ltd., Imperial Chemical House, Millbank, S.W.1.—A booklet entitled "The Properties and Uses of Malleable Nickel."

Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—A special Christmas blotter.

Donovan & Co., 47, Cornwall Street, Birmingham.—A leaflet describing a hand inspection lamp with acid-resisting rubber handle.

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.—A blotter featuring the company's new lighting fitting showrooms.

Korting & Mathiesen Electrical, Ltd., 711 and 715, Fulham Road, S.W.6.—A card illustrating "Kandem" one-piece enclosed lighting fittings.

Brookhirst Switchgear, Ltd., Chester.—Catalogue No. 15, illustrating and describing a.c. and d.c. control gear.

Universal Electric Lamp Co., 89, Great Eastern Street, E.C.2.—Price lists of "Yunos" lamps, Christmas decoration sets and electrical accessories.

Anglo-Swiss Electrical Co., Ltd., 15, Victoria Street, S.W.1.—Two pamphlets on temperature-measuring equipment.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A booklet (A.G. 5991) relating to electrical equipment for the farm and market garden.

L. Wilkinson, 8, City Road, Finsbury Square, E.C.1.—An illustrated catalogue of bells, torches and electrical and radio accessories.

Clifford & Snell, Ltd., Sumner Road, Croydon.—A catalogue illustrating and describing the company's "Loudaphones."

Ferranti, Ltd., Hollinwood, Lancs.—List Wb 522/1, illustrating and describing components for mains radio receivers.

Crompton Parkinson, Ltd., Bush House, Aldwych, W.C.2.—A pamphlet relating to the company's new "B.R.I." repulsion-induction motors.

Reduction of Capital

The Potteries Electric Traction Co., Ltd., has presented a petition to the High Court for the confirmation of the reduction of capital from £600,000 to £244,750. The petition will be heard in London on December 14th.

Dissolution of Partnership

Carbo Electrode Co., Proctor House, Newcastle-upon-Tyne.—Messrs. T. H. Seed, F. R. C. Seed, J. T. Carr, and N. W. Purvis have dissolved partnership. Mr. Carr will attend to debts and carry on the business at Ladypark, Ravensworth, Gateshead.

Bankruptcy Proceedings

R. H. Chambers (trading as R. H. Chambers & Co.), electrical engineer, Market Street, Dartford, Kent.—The receiving order was made recently on the debtor's own petition. According to the statement of affairs there are liabilities amounting to £524 against assets of £315, leaving a deficiency of £209. Debtor attributes his failure to depression in trade, insufficient capital, and heavy overhead charges. As a result of the first meeting of creditors Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby and Hawkins, 4, Charterhouse Square, E.C., was appointed trustee with a committee of inspection. The following are creditors:—

	£		£
Baxter & Caunter, Ltd. ...	27	Maybrook Electrical Co., Ltd.	33
Credenda Conduits Co., Ltd.	41	Tellus Super Vacuum Cleaner Co.	32
Falk, Stadelmann & Co. ...	59		

L. A. Hackett (Davenport, Hackett & Co.), electrical engineer and contractor, 21, Crosby Road, Birkdale.—Application for discharge to be heard on January 18th at the Court House, Quay Street, Manchester.

W. P. Barnell, electrical engineer, 25A, Sheep Street, Northampton.—Application for discharge to be heard on January 11th at the County Hall, Northampton.

A. W. Creasey (Essex Electrical Storage Co.), engineer, Foundry House, Hall Lane, Walton-on-Naze.—Receiving order made December 2nd on debtor's own petition.

T. P. Kelly (trading as J. Kelly), wireless dealer, 153, Brookmill Road, Deptford, S.E.—Receiving order made November 24th on a creditor's petition. First meeting, December 18th, at 29, Russell Square, W.C. Public examination, January 19th, at the Court House, Greenwich.

Company Liquidations

F. J. Ashton, Ltd., wireless accessory agents and importers, 20, Cheapside, London, E.C.2.—The statutory meeting of creditors was held on December 7th at the offices of Messrs. Percy Phillips & Co., 118-120, Great Portland Street, W., when a statement of affairs was submitted which disclosed liabilities of £518, of which £487 was due to the trade and £31 to expense creditors. After allowing £72 for preferential claims and £335 for debenture, etc., the net assets were £162, leaving a deficiency of £356. Prior to the meeting of creditors, the shareholders had passed a resolution nominating Mr. Phillips as liquidator, and this appointment was confirmed.

Faringdon Electricity Supply Co., Ltd.—Particulars of claims by December 23rd to the liquidator, Mr. H. Fraser, 4, Fenchurch Avenue, E.C.

R. B. Heckie & Co., Ltd.—Winding-up completed. First and final dividend of 2s. in the £ declared.

The Wadebridge & District Electric Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. Fraser.

Electricity Supply

Lighting, Domestic, Power

Ashford (Kent).—EXTENSIONS.—The Urban District Council has decided, subject to an unemployment grant being secured, to extend the supply of electricity to Shadoxhurst and Westwell.

Barnet.—PURCHASE OPTION WAIVED.—The Urban District Council has decided to waive its right to purchase the Barnet section of the North Metropolitan Electric Power Supply Co.'s undertaking for certain considerations.

Blackburn.—MAINS EXTENSIONS.—The Town Council has approved a scheme for the extension of mains to the Lancashire Cotton Corporation's Griffin Mill at a cost of £895.

Brighton.—CHANGE-OVER.—The Southwick supply is to be changed over to a.c. at a cost of £12,686.

STREET LIGHTING.—Sixty-three electric street lamps are to be erected on the Whitehawk Estate at a cost of £800.

CHRISTMAS LIGHTING DECORATIONS.—The Electricity Committee has arranged with the Traders' Association for festoon lighting during the Christmas shopping period at a flat rate of 2d. per kWh.

TESTING EQUIPMENT.—The Committee has authorised the purchase of mains testing and fault localising equipment at an estimated cost of £650.

Bristol.—DOMESTIC ELECTRIFICATION.—The Corporation Electricity Committee reports that the £100,000 sanctioned in January, 1930, for house services will shortly be exhausted, and that at the present rate of increase in the number of new connections it is estimated that £150,000 will be required to cover this expenditure for the next three years.

NEW SUB-STATION.—The Electricity Committee is to provide a sub-station at Bath Hill, Keynsham.

Burnley.—SUPPLY TO CLIVIGER.—The Electricity Committee is receiving a deputation from the Cliviger Parish Council regarding a supply of electricity. The Council is being asked to make a canvass of residents to ascertain the probable number of consumers.

PROGRESS DURING OCTOBER.—The Corporation Electricity Department in October had a total of 3,206 prepayment meters and 1,447 consumers on the rateable value system. During the month 125 electrical appliances were supplied on hire-purchase or hire terms and 137 new consumers were added.

Canada.—ANOTHER HYDRO-ELECTRIC SCHEME FOR ALBERTA.—The Calgary Power Co., Ltd., is undertaking survey work on a proposed power site on the Athabaska River, near Edson, Alberta, although no immediate development is contemplated. The cost of the development if eventually undertaken has been estimated at $5,000,000; the proposed plant will be about 150 miles west of Edmonton.

NEW DISTRIBUTION SYSTEM INAUGURATED IN NOVA SCOTIA.—The Nova Scotia Power Commission recently put into operation its eighth hydro-electric power system, when energy was delivered at Antigonish from the Sheet Harbour system. Power is carried a distance of 39 miles, a 13,200-V line having been erected. With eight systems in operation the Commission now has lines serving a territory over 400 miles in length.

Carlisle.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £1,189.

Clitheroe.—SPECIAL ORDER.—The Town Council has decided to ask the Electricity Commissioners for a Special Order authorising it to supply the whole of the Clitheroe and Bowland rural areas, including Chipping, Hurst Green, Mytton, Slaidburn, and Gisburn.

Colinsburgh (Fifeshire).—ELECTRICITY NOW AVAILABLE.—The village, which had its gas supply cut off some time ago because the local gas company was working at a loss, is now supplied with electricity from overhead lines which run to other places on the coast.

Continental.—ITALY.—According to *L'Energia Elettrica*, the capacity of the power stations in Italy at the end of September last amounted to 4,366,000 kW, as compared with 4,230,000 kW at the corresponding date of 1930, an increase of 3.21 per cent. Of the total, hydro-electric plants were responsible for 3,583,000 kW and steam and internal combustion engine stations for 783,000 kW. The output of electricity during the first nine months of the year is estimated at 7,443,698,000 kWh, as against 7,677,315,000 kWh in the corresponding period of 1930, a decrease of 3.04 per cent.

Dumfries.—ASSISTED WIRING.—The Town Council has decided to install electricity in municipal houses at a cost of £11 11s. per house, and to recover the cost by making an additional charge of 1d. per kWh.

Dunmow (Essex).—A SUPPLY IN THE NEW YEAR.—The County of London Electric Supply Co., Ltd., announces that a supply of electricity will be available for the town early in the New Year.

Durham.—STREET LIGHTING PROPOSAL.—The City Council is to consider a proposal to substitute electric lighting for gas lighting in the streets of the city.

Eastleigh and Bishop Stoke.—LOAN FOR CABLE.—The Urban District Council has applied for an additional loan of £540 for extra cable in connection with the sewage disposal works.

Fareham (Hants).—LIGHTING SCHEME FOR STUBBINGTON HOUSES.—The Rural District Council has decided to have electric lighting installed in houses at Stubbington, tenants to pay an extra 3d. per week until the cost of installation is repaid.

Gravesend.—LOAN FOR MAINS.—The Corporation Electricity Committee is to apply for sanction to the borrowing of £15,000 for mains and house services.

Guildford.—METERS.—The Town Council has applied for sanction to a loan of £5,000 for meters.

Hornsey.—EXTENSIONS.—The Corporation is to apply for sanction to the borrowing of £2,500 for the supply of electricity to Council houses on the Hornsey and Highgate estates. Mains extensions costing £1,066 have been authorised.

Irish Free State.—SHANNON SCHEME CHARGES.—It is understood that a debate on the increased charges for electricity in the Irish Free State is to take place in the Dail. In the meantime, the Electricity Supply Board has refused Limerick consumers any preferential treatment or revision, and consequently the new charges will be put into force. One of the points made by the deputation which waited on the Board was the proximity of the city to the generating station at Ardnacrusha. It was pointed out, however, that Limerick would be getting energy more cheaply, even at the increased rate, than some other places.

Irlam and Cadishead.—A SUPPLY NEXT MONTH.—Difficulties which have arisen in connection with the supply of electricity from the Stretford and District Electricity Board have been overcome, and it is anticipated that a supply will be available before the end of January. The Council has decided to adopt electricity for street lighting.

London.—SOUTHWARK.—The County of London Electric Supply Co., Ltd., is to erect a sub-station in Providence Place.

Malvern.—LATE SHOP-WINDOW LIGHTING.—The Urban District Council has decided to supply electricity for late shop-window lighting at 2½d. per kWh, the minimum period of lighting being reduced from three to two hours per evening.

Manchester.—PROGRESS DURING OCTOBER.—During the month of October the Corporation Electricity Department showed an increase of 3,998 kW in connections, bringing the total to 462,700 kW. Applications received for supplies, including additional supplies, numbered 2,155, representing 4,350 kW. There were 190 new cookers connected, making a total of 8,497 now on circuit, while orders received for the hire of cookers numbered 230. At October 31st, 17,261 consumers had been changed over from d.c. to a.c., while work was in progress involving 1,441 consumers.

VOLTAGE-REGULATION EQUIPMENT.—In connection with a proposal to install automatic voltage-variation equipment in sub-stations, the Corporation Electricity Committee proposes to spend £27,500 on plant and cable work and £5,000 on building work. A further sum of £5,100 is needed for switchgear, &c., at the Queen's Park and Stuart Street sub-stations.

Molesey (Surrey).—STREET LIGHTING.—The Urban District Council has accepted the tender of the London & Home Counties Joint Electricity Authority for street lighting for a period of ten years, thus replacing gas lighting. There will be a direct saving of £1,300 for the first year.

Morpeth (Northumberland).—OVERHEAD LINES.—No objection is to be offered by the Rural District Council to the proposal of the Newcastle-upon-Tyne Electric Supply Co., Ltd., to erect overhead lines at Chevington Drift and to place overhead lines for the extension of Widdrington station network.

Perth.—ELECTRIC LIGHTING FOR COUNCIL HOUSES.—It is recommended that electric lighting shall be installed at Corporation houses at Darnhall Drive. At present the houses are lighted by gas.

Plymouth.—HOSPITAL SUPPLY.—The Corporation Health Committee has obtained sanction to a loan of £1,050 for laying cables at the City Hospital.

FREE-WIRING SCHEME.—Application is to be made for sanction to a loan of £10,000 for the free-wiring scheme.

SUPPLY TO PENNYCROSS.—The Electricity Committee is to negotiate with the Plympton Rural District Council regarding a proposal to extend cables to Pennycross at a cost of £611.

PROPOSED REDUCTION OF CHARGES.—A sub-committee has been appointed by the Electricity Committee to consider the question of the reduction of charges for electricity for business premises after the usual closing hours.

Reigate.—TWO-PART TARIFFS.—The Town Council has appointed a sub-committee to report on the introduction of two-part tariffs.

Ripon.—SUPPLY TO NEIGHBOURING VILLAGES.—At a recent meeting the Rural District Council decided to send a letter to the City Council asking that authority, either to take immediate steps with regard to its suggested supply of electricity to villages in the rural area, or stand aside and allow some other body to provide the service.

Rochdale.—CHRISTMAS LIGHTING DECORATIONS.—Discussions are taking place between the Rochdale Chamber of Trade and the Corporation Electricity Committee with a view to introducing a decorative lighting scheme for Christmas shopping.

St. Helens.—MAINS EXTENSIONS.—The Corporation Electricity Committee has received sanction to a loan of £4,084 for mains and buildings. Mains extensions are to be undertaken to large portions of the villages of Bold and Burtonwood.

Sittingbourne.—STREET LIGHTING.—The Urban District Council has accepted the terms of the Kent Electric Power Co. for lighting the George Street Estate for a period of six years.

Skelmorlie (Ayrshire).—SPECIAL ORDER.—Application has been made to the Electricity Commissioners by the Skelmorlie Electric Supply Co., Ltd., for a Special Order authorising it to extend its supply area.

Sleaford.—BULK SUPPLY.—The Urban District Council has declined an offer by the Central Electricity Board to supply electricity in bulk as the price quoted was higher than the present cost of generating. The Board is to be informed that more favourable terms would be considered by the Council.

South Africa.—NEW ELECTRICITY SCHEMES.—The ratepayers of Porterville, Cape Province, have sanctioned a loan of £6,000 for an electricity scheme. The Town Council of Krugersdorp, Transvaal, is also to spend £9,000 on improvements to the electrical distribution system.

Stanhope (Durham).—ELECTRICITY FOR UPPER WEARDALE.—The Parish Council has decided to apply for sanction to a loan of £1,458 for the purpose of supplying electricity to Upper Weardale.

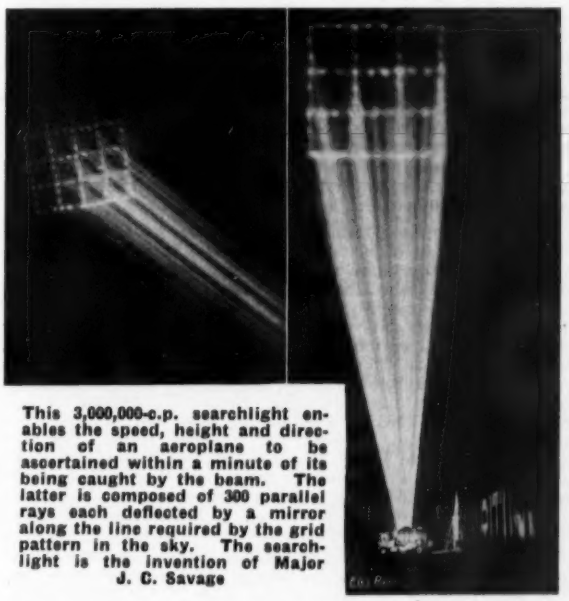
Torquay.—LOAN FOR FEEDERS.—The Electricity Committee is to apply for sanction to a loan of £50,400 for new h.p. feeders from Newton Abbot to Torquay.

NEW SUB-STATION.—A sub-station is to be erected near Torre Abbey.

SPECIAL ORDER.—The Electricity Committee is seeking an Order authorising it to supply electricity to the village of Street.

Tunbridge Wells.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £18,028 for mains and sub-station equipment, and £15,836 for the hire-purchase wiring scheme.

Turkey.—ELECTRICAL PROGRESS.—Despite the industrial depression there is an increasing demand for electricity in the Constantinople district, the sales of the Société Turque d'Electricité during the nine months ended September last amounting to 51,800,000 kWh as compared with 44,328,000 kWh in the corresponding period of 1930. During the same period the number of customers increased from 59,032 to 69,962 and the load from 59,171 to 70,623 kW. The company has recently secured a concession to supply thirty-four towns and villages on the Asiatic side of the Bosphorus.



This 3,000,000-c.p. searchlight enables the speed, height and direction of an aeroplane to be ascertained within a minute of its being caught by the beam. The latter is composed of 300 parallel rays each deflected by a mirror along the line required by the grid pattern in the sky. The searchlight is the invention of Major J. C. Savage

Ulverston.—SUPPLY TO FACTORY.—The Urban District Council has received an application for a supply of electricity to a new wool-spinning factory in Morecambe Road.

Warrington.—YEAR'S WORKING.—We have received from Mr. F. V. L. Mathias, borough electrical engineer and tramways engineer, a copy of his annual report, together with a statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £141,803, as compared with £141,362 in the preceding year, while the working expenditure increased from £84,977 to £85,661. There was a net profit of £13,559, as compared with £19,866 in 1929-30. During the year £29,958 was spent on capital account, making a total of £615,552 invested in the undertaking. Sales of electricity declined from 24,596,032 to 24,206,390 kW, but the maximum demand rose from 10,600 to 10,800 kW. The average price obtained per kWh increased from 1.27d. to 1.32d., in spite of reductions in charges made to

practically every class of consumer. The number of consumers connected during the year was 1,098, bringing the total to 8,620. Good progress was made with the development of new areas, and in the southern area an 11,000-V overhead line is in process of erection, the first two sections through Appleton to the High Legh boundary being already in operation. An assisted-wiring scheme was introduced during the year.

Westmorland.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order authorising Thomas Wilkinson (Arnside), Ltd., to supply electricity in the borough of Appleby, the urban districts of Kirkby Longside, Shap and Carnforth, the rural districts of East Westmorland and West Ward and parts of the rural districts of South Westmorland and Lancaster.

York.—LOANS.—The Corporation Electricity Committee has obtained sanction to loans of £25,959 for mains and services and £5,000 for sub-station equipment.

LATE SHOP-WINDOW LIGHTING.—It is proposed to reduce the charge for electricity for shop-window lighting and advertising signs after closing hours from 2½d. per kWh and 40s. per annum rental for meter and time switch to 2d. per kWh and 30s. rental.

SUPPLY TO BURN HALL.—The Electricity Committee is seeking an Order to supply electricity to Burn Hall, Easingwold.

Traction

Argentina.—BUENOS AIRES.—On December 1st the Central Argentine Railway inaugurated its newly electrified suburban lines, 111 miles in length, over which 500 trains a day will run. The complete scheme comprises 384 miles. The last section of the Lacroze Underground Tramway was also opened for public traffic on the same day. Carrying a double track, this railway has been constructed in two sections, the first of which, 7 km. long and serving the commercial centre of the city, has already been opened. The lines start from the Frederico-Lacroze terminus of the Ferrocarril Central de Buenos Aires, pass under the Calles Triunvirato and Corrientes, and end near the Retiro station of the Central Argentine Railway. The second and final section, about 3 km. long, runs eastward. At the tunnel stations mezzanines have been provided with escalators (the first installed in Buenos Aires). Automatic turnstiles allow persons to pass upon a nickel (5 cents) being dropped into a slot. Signals of the latest type, with automatic safety-stop devices, are used. A considerable proportion of the rolling-stock was built to special design in the United Kingdom.—*Reuter's Trade Service* (Buenos Aires).

Brighton.—AUTOMATIC TRAFFIC SIGNALS.—The Coporation Watch Committee is to invite specialist firms to quote for the provision of automatic traffic signals.

Canada.—ELECTRIC RAILWAY STATISTICS FOR 1930.—The Dominion Bureau of Statistics at Ottawa, in its final report for 1930 on the operation of electric railways in Canada, says that during the year 792,701,493 passengers were carried, a decrease of 5.3 per cent., attributed to the prevailing business depression. Only five out of the fifty-three railway systems showed increased earnings, and thirteen failed to earn their operating expenses. The gross revenues of all Canadian electric railways amounted to $54,719,259, as compared with $58,368,980 in 1929, whilst net operating revenues declined from $18,183,840 to $15,593,744 after paying taxes and other deductions from income. Twenty-two systems showed deficits amounting in all to $1,066,087, and thirty-one railways showed a profit of $11,073,164. Reserves and special charges amounted to $6,764,556, and seven railway systems paid dividends amounting to $3,403,261 as against $3,325,248 paid in 1929. The total mileage of main track operated was 2,080.

Continental.—BELGIUM.—The Belgian National Railway Company has been examining for several years a programme for the electrification of some of its lines. According to an engineer's estimate the electrification of the so-called Luxemburg line, from Brussels to Arlon, and of the Marloie-Liège branch line would effect an annual saving of 20,500,000 fr., or 14½ per cent. of the present expenditure on steam traction. This figure was arrived at after the interest and redemption charges on the capital needed for the electrification had been deducted. Negotiations are proceeding with contractors for this work.—*Reuter's Trade Service* (Brussels).

ITALY.—In a recent issue of the *Rivista Tecnica delle Ferrovie Italiane*, some particulars are given of the electrification work recently completed on the railway between Spezia and Leghorn. The trains are operated by three-phase a.c. at 4,000 V, supplied mainly from a steam-operated generating station at Torre del Lago and from the hydro-electric plants on the River Ozola of the Societa dell' Adamello. Five 60,000/4,000-V substations, at distances of from 12½ to 20 miles, have been erected along the line to feed the overhead conductors. A feature of the installation is that owing to the saline vapours of the district, special means have been adopted for the cleaning of the line insulators from time to time.

Gloucester.—TRAMWAY ABANDONMENT.—It is proposed to complete the substitution of 'buses on the remaining tramway route early in the New Year.

London.—VISIT OF RUSSIAN COMMISSION.—In connection with the scheme for the construction of an underground railway in Moscow a special commission of the Moscow Soviet has arrived in London to investigate the transport services. The commission has already visited several towns on the Continent.

Newcastle-on-Tyne.—TRAMWAY ABANDONMENT PROPOSAL.—The City Council has again deferred its decision with regard to a proposal to substitute 'buses for trams on the Osborne Road route.

TRAMCAR IMPROVEMENTS.—The Tramways Traffic Sub-Committee has recommended the Council to place into operation five additional tramcars which have been reconditioned and fitted with upholstered seats and additional lighting.

Tees-side.—NEW TROLLEY-'BUSES.—The Tees-side Railless Traction Board has decided to purchase eight new trolley-'buses at a cost of £12,600.

United States.—HIGH-SPEED TRAMS.—Ten streamlined trams, claimed to have a maximum speed of 100 m.p.h., have recently gone into service on a thirteen-mile suburban line at Philadelphia. They are said to have a " cruising speed " of eighty-three miles an hour, but at present they are not being run at more than 70 m.p.h. The cars, which are a brilliant scarlet with bright chromium window frames and other trimmings, cost £8,000 each, and have 100-h.p. motors. Wind-tunnel tests conducted at the University of Michigan and the Westinghouse Research Laboratories showed, according to the manufacturers, that the streamlining results in a power saving ranging from 17 per cent. at a speed of 20 m.p.h. and 42½ per cent. at 90 m.p.h. When the new trams went into service the scheduled running time for the journey was reduced from 24 to 16 minutes, and it is planned to speed up the service even more after the cars have been running for some time. A test car made the 13-mile run in 12 minutes.—*Reuter.*

Communications

Australia.—NEW BROADCASTING STATION.—A new " B " class broadcasting station has been opened at Hamilton, Victoria, for the Western Province Radio Co. It operates on a wavelength of 297 metres, with a power of 200 W in the aerial.

Belgium.—BROADCAST LICENCES.—The number of licensed listeners is about 200,000, but new licences have recently been issued at the rate of about 1,000 per day, says *World-Radio*, as a consequence of a number of prosecutions which have resulted in the imposition of heavy fines.

Germany.—BROADCAST LICENCE FEES.—Nearly £500,000 a year profit is made by the German Ministry of Posts out of the broadcasting monopoly. Only one-fifth of the licence fees is expended on programmes. Listeners are charged an annual fee of 24 marks, which they pay in monthly instalments.

Italy.—VATICAN TELEPHONES.—An automatic telephone exchange has recently been completed in the Vatican City, Rome, by the Standard Elettrica Italiana working in conjunction with the International Telephone and Telegraph Co., of New York.

Palestine.—TELEPHONY INCREASING.—According to a D.O.T. report on Palestine's economic conditions, prepared by Mr. K. W. Stead, Director of Customs, Excise, and Trade at Haifa, the use of the telephone system is increasing; both local and trunk lines were heavily used in 1930, and there was a continued demand for installations, especially in outlying Jewish colonies and settlements.

Telegraph traffic decreased considerably in comparison with 1929.

There is no radio broadcasting service in the country, but there has been a noticeable increase in the demand for receiving licences; 218 new licences, including 18 granted to dealers, were issued in 1930.

Russia.—AERODROME RADIO STATIONS.—Aviation is said to be making rapid progress in Russia. A large number of aerodromes have been built and over 100 radio stations have been established to transmit meteorological data.—*Reuter* (Moscow).

South Africa.—TELEPHONY.—A new line has been laid from Lourenço Marques, Portuguese East Africa, to the Union border at a cost of about £4,000, and telephone communication is being inaugurated this month between Lourenço Marques and all parts of the Union. The cost of a call to Johannesburg will be 6s. 8d. during the day and 4s. 6d. at night.

Switzerland.—BROADCAST RELAYING.—*World-Radio* reports that following the Bavarian success of supplying listeners with an optional means of obtaining good broadcast reception *via* the telephone lines, Geneva, Berne, Lausanne, and Zürich have started similar services. The charge is 10.85 fr. per month for non-possessors of a telephone, but only 2.50 fr. for telephone subscribers.

U.S.A.—BROADCAST RECEIVING SETS.—A recently issued report of the U.S. Census Bureau states that the number of broadcast radio receiving sets in use on April 1st, 1930, was 12,563,000. The Columbia organisation estimates that since that date about 4,750,000 sets have been sold to people who did not previously possess receivers.

It is reported that the Squire wired-wireless " Neonphone " system is to be used for distributing broadcast radio programmes in Cleveland. Superimposed upon 60-cycle electricity distribution network, there will be a 13-kc. carrier current, which will be stepped up in multiples of 13 to deliver three separate programmes at frequencies of 26, 39, and 52 kc. simultaneously into the homes of subscribers, who will simply plug their reproducers into the ordinary lighting sockets.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Auchinlech (AYRSHIRE).—December 16th. Various works, including electric lighting at new special school and clinic. Schedules from Mr. William Reid, county architect, 14, Wellington Square, Ayr.

Australia.—MELBOURNE.—January 20th. City Council. Ring main metalclad 6,600-V switchgear. (A.X. 11210.)*
February 3rd. Totally enclosed metalclad 6,600-V switchgear. (A.X. 11211.)*

Birmingham.—December 16th. Corporation. Electric lighting and power installation at new police station, Steelhouse Lane. Specifications (deposit £5) from the city engineer and surveyor.

Dumbarton.—County Council. Electrical work at Cumbernauld Public School. Particulars from the county clerk, 18, Park Circus, Glasgow, C.3.

Dundee.—December 16th. Electricity Department. Reinforced concrete piled foundation work for coal- and ash-handling plant at Carolina Port generating station. Specifications, &c., from Mr. D. H. Bishop, general manager and engineer.
December 16th. Electricity Department. Cable. (December 4th.)

Eccles.—December 16th. Watch Committee. Electric lighting installation at new fire station, Liverpool Road, Patricroft. Specification (deposit £1 1s.) from the borough electrical engineer, Electricity Offices, 1, King Street.

Edinburgh.—December 14th. Corporation. Electric lighting and power installation at Seafield Hospital, Leith. Specification, &c., from the Engineer's Office, Dewar Place (deposit £1 1s.).

Egypt.—CAIRO.—January 23rd. Ministry of the Interior. 3,175 meters for Mansourah.—*Reuter's Trade Service.*
February 18th. Diesel engine driven power station (400 kVA) for Samallout. (A.X. 11209.)*
February 18th. Waterworks, with electric pumping equipment, for Samallout. (G.X. 10962.)*

Greece.—ATHENS.—Fire Brigade Service. Telephones. (A.X. 11192.)*

Hailsham (SUSSEX).—December 22nd. Rural District Council. Wiring houses for electric lighting, School Lane, Ninfield. Particulars from Mr. W. O. Humphrey, engineer, 17, London Road.

Halifax.—January 2nd. Tramways Committee. Electrical work at omnibus garage, Elm Wood. Specification and form of tender (deposit £2 2s.) from Mr. A. C. Tipple, borough engineer, Crossley Street.

Harrogate.—December 15th. Corporation. Overhead lines. (November 27th.)

Lerwick.—December 18th. Town Council. (*a*) Oil engine driven generating plant, battery, switchgear, crane, distribution mains and public lamps; and (*b*) structural steelwork. Specifications (deposits £2 2s. for (*a*) and £1 1s. for (*b*)) from Mr. J. A. Bell, Millburn Street, Aberdeen.

London.—CENTRAL ELECTRICITY BOARD.—December 18th. Construction of site works, foundation works, &c., at Cardiff and Newton Abbot. (November 20th.)
ISLINGTON.—January 15th. Electricity Department. Twelve months' supply of electrical stores. (December 4th.)
L.C.C.—December 14th. Installation of electric bell systems at Brook Hospital, Shooters Hill, S.E. (December 4th.)

New Zealand.—WELLINGTON.—January 26th. Post and Telegraph Department. 300 lamp jacks and 1,000 alarm fuses. (A.X. 11203.)*
January 27th. Telephone cords. (A.X. 11202.)*
January 28th. 100 automatic dials. (A.X. 11201.)*

Northern Ireland.—ELECTRICITY BOARD.—January 18th. 33-kV overhead transmission line. (See this issue.)

Plymouth.—Corporation Watch Committee. Electric lighting and heating at Octagon police station and overhauling the electrical installation at the detention house.
December 15th. Electricity Department. Steam boilers. (November 27th.)

South Africa.—RAND WATER BOARD.—January 8th. Horizontal centrifugal pump, electric motor and other electrical gear. (G.X. 10941.)* Vertical spindle centrifugal pump and electric motor. (G.X. 10942.)*
CAPE TOWN.—January 6th. Electricity Department. Capacitor equipment. (A.X. 11197.)* Globes, reflectors and galleries for electric street lamps. (B.X. 7199.)*

Turkey.—ANKARA.—December 22nd. Ecole Supérieure du Génie. Electrical instruments and apparatus. (A.X. 11207.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Australia.—P.M.G.'s DEPARTMENT.—Accepted. High-voltage smoothing condensers.—H. Hecht & Co. Dry cells.—Widdis Diamond Dry Cells Pty., Ltd. Accumulator cells.—Exide Batteries of Aust., Ltd.; Tudor Accumulator Co., Ltd.
N.S.W. RAILWAYS DEPARTMENT.—2,500-kW alternator.—Australian General Electric Co., Ltd.
VICTORIAN ELECTRICITY COMMISSION.—Switchgear for Belmont sub-station and main switchboard for Flinders street building.—Metropolitan-Vickers Australia Pty., Ltd.
—*Electrical Engineer and Merchandiser.*

Brighton.—Electricity Committee. Accepted. Renewal of contract for twelve months for the supply of lamps for street lighting.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.

Dundee.—Housing Committee. Accepted. Electrical installation at Sandeman Street housing scheme (£1,020).—Stenson & Co.

East Ham.—Electricity Committee. Recommended. 250-kVA transformer (£122).—English Electric Co., Ltd. Cable (£1,744).—Enfield Cable Works, Ltd.

Gravesend.—Electricity Committee. Recommended. Switchgear for boiler extension circuits (£208).—British Thomson-Houston Co., Ltd.

Leeds.—Electricity Committee. Accepted. Cables. Edison Swan Cables (£439); Metropolitan Electric Cable & Construction Co. (£1,614); Derby Cables (£997).
Tramways Committee. Accepted. Cadmium-copper trolley wire (£409), and flexible copper bonds (£181).—British Insulated Cables.

Liverpool.—Electric Power and Lighting Committee. Accepted. Meter testing equipment for the Highfield electric meter testing room (£437).—Ferranti, Ltd.
Recommended. H.p. switchgear for Highfield Street sub-station (£3,613).—Metropolitan-Vickers Electrical Co., Ltd.
Corporation Housing Committee. Accepted. Electrical installations in 118 tenements at Dingle Lane (£995).—James Stott & Sons, Ltd.

London. — Metropolitan Water Board. Recommended. Machinery for Kempton Park pumping station.—Worthington-Simpson, Ltd.

Portsmouth.—Baths Committee. Recommended. Re-wiring public baths (£106).—G. W. Bentley.

Rotherham.—Electricity Committee. Recommended. Cable (£3,583.)—Callender's Cable & Construction Co.

South Shields.—Town Council. Accepted. Electric wiring in 236 houses at Tyne Dock (£1,354).—B. L. Oliver.

Stirling.—Town Council. Electrical work in connection with housing scheme.—H. A. Miller.

Worthing.—Town Council. Accepted. Wiring new electricity showrooms.—Phillips & Dart.

Forthcoming Events

Edinburgh Electrical Society.—Friday, December 11th. Macvitties, Guest & Co., Ltd., Rooms, Edinburgh. 7.45 p.m. Annual whist drive and dance.

Association of Mining Electrical Engineers (*Western Sub-Branch*).—Saturday, December 12th. Y.M.C.A., Swansea. "Automatic Sub-stations." Mr. A. Rees. (*South Wales Branch.*)—Saturday, December 19th. Royal Hotel, Cardiff. 6 for 6.15 p.m. Annual dinner and dance.

Association of Supervising Electrical Engineers.—Tuesday, December 15th. Junior Institution of Engineers, London. 7.15 p.m. "The Legal Position Governing Employment Conditions of Supervising Engineers." Mr. C. Nyholm-Shawcross.

Paisley Association of Electrical Engineers.—Tuesday, December 15th. Russell Institute, Paisley. 7.30 p.m. "Electricity in Public Health Work." Dr. C. M. Whiteford.

Rugby Engineering Society.—Wednesday, December 16th. Benn Buildings, Rugby. 7.30 p.m. "Individual Electric Drives." Mr. D. Milner.

Overhead Lines Association.—Wednesday, December 16th. Institution of Electrical Engineers, London. 5 p.m. "Lightning and Surge Protection."

Institution of Electrical Engineers.—Thursday, December 17th. Institution, London. 6 p.m. "The High-voltage Systems of Italy." Mr. A. Dalla Verde. (*Meter and Instrument Section.*)—Friday, December 11th. Criterion Restaurant, W. 6.45 for 7 p.m. Annual dinner. (*London Students' Section.*)—Saturday, December 12th. 2.30 p.m. Visit to the Holborn Automatic Telephone Exchange. Friday, December 18th. Institution, London. 6.15 p.m. "The Theory and Design of the Gramophone Pick-up." Mr. W. D. Oliphant. (*North-Eastern Centre.*)—Monday, December 14th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "The High-voltage Systems of Italy." Mr. A. Dalla Verde. (*Western Centre.*)—Monday, December 14th. Merchant Venturers' Technical College, Bristol. 6 p.m. "The Electric Heating of Buildings." Mr. R. Grierson. (*Scottish Centre.*)—Tuesday, December 15th. North British Station Hotel, Edinburgh. 7 p.m. "Electrical Measurement and its Service to Industry." Mr. F. C. Knowles. (*North-Western Students' Centre.*)—Tuesday, December 15th. Engineers' Club, Manchester. 7.15 p.m. Informal discussion on "Electricity Tariffs" and "The Selling of Electrical Apparatus." (*South Midland Students' Section.*)—Tuesday, December 15th. The University, Birmingham. 7 p.m. "Oil Filled Cables." Mr. R. E. G. Horley. (*North-Midland Students' Section.*)—Tuesday, December 15th. Hotel Metropole, Leeds. 7.15 p.m. "Modern Developments in Protective Gear for Three-phase Lines and Feeders." Mr. D. J. Pearce. (*North-Eastern Students' Section.*)—Friday, December 18th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Address by Mr. R. W. Gregory.

Birmingham Electric Club.—Friday, December 18th. Grand Hotel, Birmingham. 7 p.m. Annual meeting.

Manchester Electro-Harmonic Society.—Friday, December 18th. Waldorf Hotel, Manchester. 7 p.m. Smoking concert.

Junior Institution of Engineers.—Friday, December 18th. Institution, London. 7.30 p.m. "The Development of the Talking Picture." Mr. W. Harris.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following:—

CREMAX cream making machine.

Single-type insulated connectors suitable for taking in 7/.052s. P.B.J. conductors at one end and 7/.052s. c.t.s cable out at the other end.

Notes

The I.M.E.A. and the National Canvass

Since we urged in our issue of October 23rd a systematic electrical canvass of the country, numerous indications have reached us that we faithfully expressed the feelings of all who favour a forward movement—now. In an article in the current issue of the *I.M.E.A. Journal*, municipal undertakings are urged to consider without delay what means should be adopted to secure a greater output of electricity and a more general use of domestic electrical appliances.

It is pointed out that showrooms are not effective unless the staff is ample and efficient to explain and demonstrate the various appliances. Showrooms are essential to increased sales, but some municipalities have refused to open them on the score of expense. Municipalities are generally less active than companies in publicity work. The number of potential users of electricity must be ascertained by systematic canvass. It is urged that there should be an approved course of training for women demonstrators, as proposed by the E.A.W. Some municipalities do not realise the need for a sufficient and efficient staff to develop and encourage demand. Those who are anxious to adopt an intensive advertising campaign should get into touch with E.D.A. at once. With the full operation of the grid, local generation will largely cease, but the work of the engineer and manager will increase, as he will be in a position to concentrate mainly on commercial development.

Electrical Exhibitions

Akin to the question of propaganda is that of the holding of a national electrical exhibition, and this aspect also is dealt with in the *I.M.E.A. Journal*. The exhibition arranged by the Association in connection with its annual conference is an outstanding electrical feature. It is about the only one confined to electrical exhibits, but it is viewed only by delegates and inhabitants of the town in which the conference is being held. Is there any reason, it is asked, why a national electrical exhibition should not be organised in London annually or biennially? If all the electrical organisations in the country combined to inaugurate an exhibition of electrical and ancillary equipment, it would undoubtedly receive a considerable measure of support, and would show to the public (including the overseas buyer) under one roof the advantages of industrial and domestic electrical equipment. The manufacturers are invited to give a lead, and the suggestion is recommended to the consideration of E.D.A.

The Electrolethaler

At a meeting of the Health Committee of the Sheffield Corporation the chief veterinary inspector reported that he had witnessed demonstrations of a new electric stunning machine at Birmingham and Sheffield. The chairman stated that, along with the deputy chairman of the Health Committee, the chairman of the Markets Committee, and the manager of the abattoir, he had witnessed a demonstration and was satisfied with the results. In view of the importance and urgency of the matter he had given authority for the purchase of a machine (S.R.V. Electrolethaler, No. 2) from the General Radiological and Surgical Apparatus Co., Ltd., for use only by an employé of the Corporation. The Committee agreed that the electrolethaler is an instrument suitable and sufficient for the purpose of stunning pigs, as required by the bylaw on this subject.

The Leeds Corporation Health Committee's chief veterinary officer has also reported on a demonstration of the electrical stunning of pigs before slaughter at Sheffield, and the matter has been referred to the Markets Committee for consideration.

Heating Towns in Russia

The system of heating by hot water derived from electric power stations, quite a new thing in Soviet Russia, is beginning to play a very important part in the fuel turnover of the country. At present this system in Moscow comprises 26 km., serving 60 large enterprises, and at Leningrad 32 km. Thermo-electric central power stations have started working at Kharkov, Samara, Kazan, and other large places. The new system of heating towns will be largely extended next year, 430 km. more being installed at industrial centres.—*Reuter's Trade Service.*

Overhead-line Flash-overs

Interesting comments on the tendency of overhead-line insulators to flash-over at sunrise are made by Mr. Norman Rowe in the *Electrical World*. He explains that the coldest period of the day is just before sunrise. There is a quick rise of temperature at sunrise, and a cold mass of porcelain (particularly if attached to a steel tower) will act as a condenser and become covered with a layer of moisture, followed by electrical leakage. Such has been his experience in Mexico and the United States. The flash-over voltage is governed by the generator and transformer capacity behind the line. Consecutive tests show that the leakage and flash-over voltages diminish after each test; the lowest values occur after several tests when the insulator has apparently become free from condensation and slightly warm. He contends that at first condensation forms in drops which later spread in a thin continuous layer. Condensation and fog represent more severe conditions than rain tests.

Appointments Vacant

Mains superintendent and sales engineer for the Electricity Board of Northern Ireland.

Electrical engineer and manager for Louth Corporation.

Resident electrical engineer for East Grinstead Urban District Council.

Electrical engineer and manager for Norton Electricity Department.

Chief engineer for the Central Middlesex County Hospital, Willesden.

Borough electrical engineer for Stockport.

Chief clerk for Middleton Electricity Department.

Two installation inspectors for Southend-on-Sea Electricity Department.

(See our advertisement pages to-day.)

The New Ballroom at Claridge's

An excellent example of modern methods of ballroom lighting is to be seen at the extension which has recently been completed at Claridge's Hotel, London (see p. 875). The new building adjoins the old premises, but a separate entrance has also been provided from Brook Street. A corridor from this new entrance leads up a short flight of steps to a hexagonal domed ante-room, on either side of which are cloakrooms and lavatories.

To the right on entering the reception hall is the Painted Room, which adjoins the old Winter Garden, while straight ahead is the lobby leading to the ballroom itself. Cornice lighting has been adopted throughout as the main source of illumination, but several other lighting devices have been employed for decorative effect. In the ballroom, in addition to six tiers of cornice lighting, there are a number of wall brackets in keeping with the general modernist design, while strip lighting illuminates a series of painted panels let into the wall. There are large mirrors at the end of the hall which are also illuminated by strip lighting.

Illuminated mirrors and other forms of glass are also used as one of the principal decorations in the reception room, the effect against the wall's general background of matt silver being most effective. In the ceiling of this room is a roof-light, which besides admitting daylight is also used as one of the sources of artificial lighting. A new kind of glass—"flashett glass"—is used. It has a pinkish tinge and besides absorbing very little of the light has the additional advantage that lamps can be placed quite close without producing a "spotty" effect. Pedestal floodlight lamps have been placed at intervals round the ante-room.

To provide against failure of the electricity supply, a special new battery room has been equipped containing 116 "Chloride" 30-Ah cells with a "Keepalite" control panel. "J & P" wiring and "Simplex" switchgear have been employed throughout the building, the electrical work having been carried out under the direction of Mr. Hill, of Messrs. T. Clarke and Co., Ltd., and Mr. Cowley, the resident engineer at Claridge's. Messrs. J. Jeffery & Co., Ltd., undertook the installation of the ventilating system.

Coal Mines Reports

H.M. Mines Department has issued several reports on the inspection of collieries in various parts of the country during 1930. They contain information relative to the output of coal, the number of persons employed, accidents and their causes, lighting, number of safety lamps used, horse power of electrical plant, &c. The reports are obtainable (price 1s. 2d. post free each) from the Stationery Office.

Educational

THE ROYAL TECHNICAL COLLEGE, Glasgow.—The annual report has just come to hand containing a list of the distinctions gained by members of the college during the 1930-31 session.

Illuminating Engineering Society

We learn that the meeting of the above society which was to be held at the Royal Society of Arts to-day, December 11th, has been cancelled owing to indisposition of the president, Sir Francis Goodenough.

Sir Charles Parsons's Work

In a lecture at the ROYAL INSTITUTION last week on "The Work of Sir Charles Parsons," Sir Alfred Ewing said that even during his lifetime Sir Charles was confidently ranked among the immortals. He attempted tasks which to other men would seem impossible, and he persevered indefatigably until they were accomplished.

I.E.E. North-Eastern Students' Dance

The seventh annual dance of the North-Eastern Students' Section of the Institution of Electrical Engineers was held recently in the Grand Assembly Rooms, Newcastle, and was attended by over 300 members with their friends. Amongst those present were Messrs. H. W. Clothier (A. Reyrolle & Co.), R. P. Sloan, H. A. Couves, B. H. Leeson, Noel Hodgson, S. E. Monkhouse, and V. Clements.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. F. M. Long, city electrical engineer, Norwich, is to retire next June under the Council's superannuation scheme. He has been connected with the electricity undertaking for forty years.

The Electricity Committee of the Bristol Corporation has given consideration to the reorganisation of the engineering staff consequent upon the increased responsibilities. **Mr. H. Faraday Proctor,** chief engineer and general manager, will retire on superannuation in October next, when he will have completed forty years' service. He will not seek any extension in an advisory capacity or otherwise. The Committee is of opinion that it is very desirable that his successor in office should take up his new duties and responsibilities at such a date as will provide for an overlapping period of a few months during which Mr. Proctor may be available for affording information or advice. It has, therefore, recommended the following appointments, as from April 1st: **Mr. Arthur J. Newman** (now deputy) as chief engineer and general manager at £1,500 per annum; **Mr. Ivor A. D. Pedler** (now mains engineer) as deputy engineer at £750 per annum; and **Mr. James Irlam** (now chief constructional draughtsman) as constructional engineer at £535 per annum.

Councillor H. K. Beale (Birmingham) has been reappointed chairman of the South-West Midlands Advisory Joint Committee, a position which he has held since the establishment of the Committee in 1923.

Mr. J. E. Allen, who for the past twelve years has been chief electrical superintendent of Messrs. Alfred Holt & Co., has been appointed manager of the Electrical Service Department of the Marconi International Marine Communication Co., Ltd.

Mr. W. F. Marchant has been re-elected chairman of the London and Home Counties Joint Electricity Authority for the ensuing three years.

Mr. H. M. Pease, of Standard Telephones and Cables, Ltd., and various other companies, has been appointed a director of the Constantinople Telephone Co. to fill the vacancy on the board caused by the resignation of Mr. F. Gill.

Mr. J. E. Lamb, formerly of Messrs. Brown Bros., Ltd., has joined Messrs. Wood & Cairns, Ltd., of Edinburgh, as joint managing director with Mr. R. K. Hill, who is the chairman of the company.

As we go to press we learn that there has been a slight improvement in the condition of **Col. R. E. B. Crompton,** to whose illness we have already referred.

Mr. Henry Ward, managing director of Ward & Co. (Dewsbury), Ltd., has been elected to the Dewsbury Borough Council. Many years ago he was an engineer in charge of an area of the Yorkshire Electric Power Co., and during the last fifteen years his firm has occupied a leading position for textile work in the Heavy Woollen District of Yorkshire.

Mr. S. Orgel, managing director of Superlamp, Ltd., has been elected a member of Shoreditch Borough Council.

Mr. F. H. Whysall, city electrical engineer and manager, Belfast, has been appointed a member of an advisory committee to assist the Northern Ireland Ministry of Commerce in matters connected with the general improvement and development of electricity supply.

Mr. Osbert Peake, M.P., has been appointed a director of the Yorkshire Electric Power Co., to fill the vacancy caused by the retirement of Mr. G. H. Peake.

Obituary

The late Mr. P. F. Allan.

Mr. P. F. Allan.—In our last issue we briefly announced the death of Mr. P. F. Allan, of British Insulated Cables, Ltd. Mr. Allan was trained as a mechanical engineer, and subsequently entered the electrical industry, and he became sales manager for the Clyde Valley Electric Power Co., Ltd. He joined the staff of Siemens Bros. Dynamo Works, Ltd., in 1910, and after nine years with that company went to the Macintosh Cable Co., Ltd., with whom he held various appointments, including that of works manager and engineer of the Liverpool cable factory (not of the Liverpool factory of British Insulated Cables, Ltd., as stated in our last issue). He joined the staff of British Insulated Cables, Ltd., in October, 1930. Mr. Allan was in his 51st year.

Wills.—Mr. Bernard Mervyn Drake, chairman and managing director of Messrs. Drake & Gorham, Ltd., and of the D.P. Battery Co., Ltd., and chairman of the National and Tudor Accumulator Companies, left £309,627 (net personalty £273,656).

Sir George H. Fisher-Smith, head of Frederick Smith and Co., and chairman of the London Electric Wire Co. and Smiths, Ltd., left £153,078 (net personalty, £141,906).

Mr. Charles Horne, electrical engineer, of Middlesbrough, left £8,471 (net personalty £249).

Parliamentary Notes

[From Our Special Reporter]

Automatic Telephones

On November 30th, Mr. Hutchison asked the Postmaster-General how many different types of automatic telephone installations were being used in the various exchanges in Great Britain; whether he was satisfied that the type most generally employed was more satisfactory in operation than that in use in the United States; and what measures were being adopted to develop an improved type of installation which would reduce the number of failures at present caused by the damp atmosphere in this country.

Sir K. Wood said that the apparatus used for automatic telephones in this country was of the "Strowger" type, adapted as the case might be for the largest cities, urban areas or rural districts. Several other systems originally installed for experimental purposes in various exchanges were still giving satisfactory service, but no further exchanges of these types would be installed. The "Strowger" system was one of the standard types used in America, and these were carefully investigated before a decision was reached to adopt the "Strowger" system in this country. He was satisfied that it was best suited to British requirements. The damp climate of this country rarely gave rise to apparatus failure since adequate measures were in force to maintain satisfactory atmospheric conditions inside the exchanges.

Telephone Extension Schemes

On November 30th, in reply to questions by Lord Apsley, Sir K. Wood said that schemes for extending the general use of the telephone in this country were constantly in hand. Considerable progress had been made in the reduction of the costs of construction and maintenance of telephone plant as well as in increasing the efficiency of the service. The benefits of the substantial economies effected during the past few years had been passed on to subscribers in the form of reductions of charges for calls and in other ways. The abolition of telephone rent charges would be a measure without precedent in any country, and would inevitably involve the subsidisation of the service by the tax-payer.

Wayleave Charges

On December 2nd, Sir Douglas Newton asked the Minister of Transport if he was aware of the high charges in connection with wayleaves made against electricity undertakings due to the complication and duplication of procedure by the solicitors representing the Ecclesiastical Commissioners, which in certain simple cases amounted to as much as 10 guineas for an annual wayleave of 2s.; and whether he was prepared to inquire into the matter in the interests of consumers of electricity.

Mr. Pybus said he had no jurisdiction over the terms and conditions in voluntary wayleave agreements.

Fumes from Power Stations

On December 3rd Mr. Bossom asked the Minister of Transport whether any decision had yet been taken as to the Government's intentions regarding the dust and fume nuisance from power stations; and when he expected to receive the Report from the Chimney Emissions Committee, which was set up to inquire into the matter.

Mr. Pybus said that with regard to the emission of sulphur fumes, he would refer Mr. Bossom to the second report of the committee presided over by the Government Chemist which was laid before Parliament in November, 1930. The Electricity Commissioners informed him that good progress had been made by the Chimney Emissions Committee, but that they were not yet in a position to say when it would be able to present its report.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Wallasey Rediffusion Service, Ltd.—Private company. Registered December 7th. Capital, £7,750 in 7,000 8 per cent. cumulative preference shares of £1 and 15,000 ordinary shares of 1s. each. Objects: To establish, maintain and develop a service for the relaying of radio programmes to subscribers and others in Wallasey and neighbourhood, and to adopt an agreement with Wallasey Corporation of the one part, and Rediffusion, Ltd., of the other part. The directors are: W. W. Wakefield, 6, St. James's Terrace, Regent's Park, N.W.8 (director, Broadcast Relay Services, Ltd.), and C. Whitcroft, Inglewood, New Wanstead, E.11 (director, Standard Radio Relay Services, Ltd.). Registered office: Bush House, Aldwych, W.C.2.

Newport Rediffusion Service, Ltd.—Private company. Registered December 2nd. Capital, £5,000 in 4,500 8 per cent. cumulative preference and 500 ordinary shares of £1 each. Objects: To establish, maintain, and develop a service for the relaying of wireless and radio entertainment programmes to subscribers and others in Newport and neighbourhood, and to adopt an agreement between the Corporation of Newport, Mon., and Rediffusion, Ltd. The directors are: W. W. Wakefield, 6, St. James's Terrace, N.W.8, and C. Whitcroft, "Inglewood," New Wanstead, E.11. Registered office: 4-5, Commercial Street, Newport, Mon.

Carwin Electric Co., Ltd.—Private company. Registered December 4th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, electricians, mechanical and marine engineers, manufacturers of and dealers in electrical and wireless apparatus, &c. The first directors are: J. W. Carwin, "Rusland," St. Andrews Avenue, Cleveleys (permanent director and chairman); F. N. Carwin, Hill Crest, Longridge, Lancs; S. Carwin, "Woodlands," Woodlands Drive, Broughton, Preston, and Stanley Carwin, 5, Northcliff Street, Preston. Secretary: F. N. Carwin.

G. Moore, Ltd.—Private company. Registered in Edinburgh on November 30th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in all electrical, wireless and radio instruments, &c. The subscribers are: Ethel E. Black, 1330, Argyle Street, Glasgow, and Elizabeth Duffy, 271, Cumberland Street, Glasgow. Secretary: S. Levine.

Ray Engineering Co., Ltd.—Private company. Registered December 1st. Capital, £3,000 in £1 shares. Objects: To acquire the business of electrical and mechanical engineers carried on by R. E. Joy and R. St. C. Carter at Waterdale Works, Southmead, Bristol. The directors are: R. E. Joy, 12, Cambridge Road, Horfield, Bristol, and R. St. C. Carter, "Beverley," Wellington Hill, Westbury-on-Trym, Bristol. Secretary: R. St. C. Carter.

Pennocks Patents, Ltd.—Private company. Registered December 3rd. Capital, £500 in £1 shares. Objects: To acquire from A. G. L. Pennock an exclusive licence to manufacture and sell in the British Isles and the Isle of Man electric batteries and apparatus under provisional Patent No. 285,674/31, dated October 15th, 1931. The directors are: R. Marus and R. J. Marus, 31, Sterndale Road, W.14. Solicitors: Boxall & Boxall, 22, Chancery Lane, W.C.2.

Electrical Measuring Instruments Co., Ltd.—Private company. Registered December 2nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, manufacturers and retailers of and dealers in electrical, mechanical and other appliances, including precision and measuring instruments, &c. The subscribers (each with one share) are: A. Kinge, 58, Montana Road, S.W.17; A. Winfield, 131, Grant Road, S.W.11. The first directors are to be appointed by the subscribers. Registered office: 55, Cardington Street, N.W.1.

"Jiffy" Electric Water Heater Co., Ltd.—Private company. Registered December 3rd. Capital, £1,000 in £1 shares. Objects: To acquire from E. A. Coxhead, the benefit of the trade mark "Jiffy" and to carry on the business of manufacturers and vendors of electric water heaters, electricians, mechanical engineers, &c. The first directors are: E. A. Coxhead (permanent managing director) and F. J. Coxhead. Secretary: H. Brown. Registered office: 9, Queen Victoria Street, E.C.4.

Wallace Drew, Ltd.—Private company. Registered December 4th. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless instruments, gramophones, mechanical, electrical and other apparatus, &c. The first directors are: W. A. Bartlett, Romford Manor, Pembury, Kent; H. Rothbarth, Wheelers, Checkendon, Oxford; and C. H. Baker, Little Horden, Goudhurst. Registered office: 25a, Mount Pleasant Road, Tunbridge Wells.

Kenneth Brooks (Radio & Television), Ltd.—Private company. Registered November 25th. Capital, £20,000 in £1 shares (16,000 "A" ordinary and 4,000 "B" ordinary). Objects: To carry on the business of manufacturers of and dealers in wireless and television sets and apparatus, &c. The permanent directors are: D. Krieger, address not stated, and M. Sobel, 17, Lordship Park, N.16. Solicitors: V. Morley Lawson, 25, Old Buildings, Lincoln's Inn, W.C.2.

Hartland Electric Light & Power Co., Ltd.—Private company. Registered December 5th. Capital, £2,000 in £1 shares. Objects: To carry on at Hartland, Devon, or elsewhere, the business of electric lighting supply, &c. The directors are: W. J. Pillman, Bay House, Hartland, Devon, and L. S. Kingsbury, New Inn, Hartland, Devon. Solicitors: Hole, Seldon & Ward, 15, The Quay, Bideford.

H. White & Co. (Derby), Ltd.—Private company. Registered December 2nd. Capital, £500 in £1 shares. Objects: To carry on the business of electricians, radio and electrical engineers, &c. The first directors are: H. S. White and L. T. White, Holborn Villa, Station Road, Mickleover, Derby. Solicitors: J. Robert Pinder & Son, 10, St. Mary's Gate, Derby.

Returns of Electrical Companies

Ship Carbon Co. of Great Britain, Ltd.—Debenture dated November 16th, 1931, to secure £29,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: J. H. C. E. Howeson, Halcot, Bexley, and A. Barrie, Lloyds Bank Buildings, 55-61, Moorgate, E.C.2.

Engineering and Lighting Equipment Co., Ltd.—Further charge on "Sphere Works," St. Albans, dated November 24th, 1931, to secure £1,005 11s. Holders: City of St. Alban Permanent Benefit Building Society.

Foster & Pullen, Ltd.—Satisfaction in full on November 13th, 1931, of first debenture dated October 19th, 1928, and registered October 23rd, 1928, securing £4,000.

Electrical Name & Numerical Sign Co., Ltd.—Satisfaction to the extent of £800 on or before August 27th, 1918, of debentures authorised November 6th, 1912, and registered January 22nd, 1913. (Notice filed November 27th, 1931.) (According to the register of mortgages, the debentures registered January 22nd, 1913, originally secured £2,000.)

Goodwin Radio, Ltd.—Particulars filed of £1,250 debentures authorised November 17th, 1931, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Fellows Manufacturing Co., Ltd.—P. A. Bristow, C.A., of 68½, Upper Thames Street, E.C., ceased to act as receiver on November 24th, 1931.

Turner, Atherton & Co., Ltd.—Capital, £140,116 in 62,861 preference and 77,255 ordinary shares of £1 each. Return dated August 14th, 1931. 49,172 preference and 51,597 ordinary shares taken up. £26,487 paid on 19,228 preference and 7,259 ordinary shares. £74,282 considered as paid on the remainder. Mortgages and charges, nil.

Rawlings Bros., Ltd.—Capital, £100,000 in 30,000 preference and 70,000 ordinary shares of £1. Return dated August 11th, 1931. 21,903 preference and 61,401 ordinary shares taken up. £83,304 paid. Mortgages and charges, nil.

Lamp Caps, Ltd.—Capital, £50,000 in £1 shares. Return dated June 11th, 1931. All shares taken up. £50,000 paid. Mortgages and charges, nil.

E. Saunders (Margate), Ltd.—Capital, £3,000 in £1 shares. Return dated July 27th, 1931. Twenty shares taken up. £20 paid. Mortgages and charges, nil.

E. A. Langrish, Ltd.—Capital, £15,000 in 7,500 preference and 7,500 ordinary shares of £1 each. Return dated October 13th, 1931. 6,215 preference and 6,300 ordinary shares taken up. £12,515 paid. Mortgages and charges, nil.

Warren Brothers (Middlesbrough), Ltd.—Capital, £20,000 in 16,000 ordinary and 4,000 deferred shares of £1 each. Return dated August 10th, 1931. 8,030 ordinary and 4,000 deferred shares taken up. £7,904 paid on 7,904 ordinary shares. £4,126 considered as paid on 126 ordinary and 4,000 deferred shares. Mortgages and charges: £1,700.

Acme Electric Wire & Cable Co., Ltd.—S. I. Wallis, of 3, King John's Chambers, Bridlesmith Gate, Nottingham, ceased to act as receiver on November 30th.

Langham Radio, Ltd.—S. Shoman, of 38, Burma Road, Stoke Newington, N.16, ceased to act as receiver and manager on September 29th, 1931. (Notice filed December 1st.)

Selson Engineering Co., Ltd.—J. H. Stephens, of 6, Clements Lane, E.C., was appointed receiver on November 26th, under powers contained in 62 debentures of £500 each, all dated February 22nd, 1921.

Cunningham, Beard & Co., Ltd.—Particulars filed of £1,050 debentures authorised November 27th, charged on the company's undertaking and property, present and future, including the whole amount being now issued.

Britain's Best Crystal, Ltd.—Mortgage dated November 11th, to secure such a sum not exceeding £300 as may be paid by the chargee under a guarantee given on behalf of the company, charged on 28, Springfield Road, Kingston-on-Thames. Holder: G. F. Stoddart, Stanways, Hatfield Broad Oak, Bishops Stortford.

Satisfaction on November 11th of charge in favour of W. S. Cox, dated May 25th, 1927, and registered July 3rd, 1930.

City Notes

The India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd., reports a gross profit of £277,116 for the thirteen months ended September 30th last, as compared with £96,702 for the year ended August 31st, 1930, and after making provision for depreciation, &c., there was a net loss of £51,594, to which is added a debit balance brought in of £72,161, making a total debit of £123,755, which is carried forward. The directors state that the severity and world-wide character of the prevailing economic depression caused the company to face, during the whole of the period under review, trading conditions of unprecedented difficulty, the full brunt of which has been borne by the overseas as well as the home sections of the business. While the result of the past thirteen months' trading shows a great improvement over the preceding year, the accentuated severity of the trading conditions has prevented the company from earning a profit. Prices of raw materials and finished products continued to decline during the year, and the greater part of the loss was due to the writing down of stocks to market prices ruling at September 30th last. While the number of orders obtained by the Silvertown and Burton factories and the consequent volume of output was proportionately greater than in the preceding year, the lower selling values at which these orders had to be taken, owing to the trade depression, resulted in a decrease in the monetary turnover. The improvement

indicated in the accounts is the direct result of the reorganisation which was commenced towards the close of the previous financial year. Many of the economies carried out have by no means had their full effect in the period under review and the reorganisation is still in progress. The work of closing the company's factory at Burton and the transfer of its manufacturing plant to Silvertown is now almost completed. None of the savings resulting from this step had become effective before the end of the period to which the accounts relate. The directors have discussed the desirability of writing down certain items in the balance sheet and their suggestions will be submitted for the consideration of the shareholders in due course. They regret that they cannot yet, under the circumstances, sanction the payment of arrears of dividend due to the preference shareholders, nor the further dividend due on January 1st next. Meeting: December 15th.

S. Smith & Sons (Motor Accessories), Ltd., held their annual meeting on December 3rd, Mr. C. P. Newman presiding in the absence of Mr. W. Henderson-Cleland (chairman). In the course of his speech Mr. Newman said that they had been working during the whole year under review upon the development of the production of clocks and among those they had successfully produced was the Smith electric clock. Synchronous clocks had been in use for many years in the United States, and over 60 per cent. of those now being sold there were of the synchronous type. The Smith clock was a British production throughout, and eighteen months had been spent on its development. The demand for it since it had been placed on the market at the beginning of October had exceeded expectations, and their programme for production had, in consequence, to be increased to 4,000 a week for the month of January. Arrangements had been made for the marketing of the clocks through the electricity supply companies, large electrical dealers, jewellers, clockmakers, and the large stores, backed up by an intensive selling organisation of their own. They were in a sound financial position to deal with the increased trade which they believed would materialise as a result of the revival of English clockmaking, quite apart from any improvement which might take place in the motor industry itself. The report and accounts were adopted.

The Newcastle-upon-Tyne Electric Supply Co., Ltd., has lodged a Bill with the Minister of Transport to secure Parliamentary sanction to the changing of the name of the company to the North-Eastern Electric Supply Co. and for the transfer to it as from September 13th, 1932, of the undertakings of the following companies:—The County of Durham Electric Power Supply Co.; the County of Durham Electrical Power Distribution Co., Ltd.; Cleveland and Durham County Electric Power Co.; Northern Counties Electricity Supply Co., Ltd.; Houghton-le-Spring and District Electric Lighting Co., Ltd.; Tees Power Station Co., Ltd.; and Carville Site & Power Co. The total area of supply under the Bill is 4,700 square miles and the combined capital will be approximately £14,000,000.

Tube Investments, Ltd., held its annual meeting on December 2nd, Mr. Arthur Chamberlain (chairman) presiding. In presenting the report and accounts (ELEC. REV., November 27th, p. 829) the chairman said that rationalisation of the tube trade had been quietly going on for years, and it provided that the future care of the industry would involve no wasteful duplication of capital, time, or application by any party. They had just decided to close two works with profit-earning ability, but they estimated that the resulting economies in a full working year would be equivalent to about 2½ per cent. on the total tube sales.

Low Temperature Carbonisation, Ltd., in its report for the year ended October 31st shows sales and revenue of £194,811 (as compared with £76,549 in 1929-30), and a credit balance of £25,129 (against £18,207), plus interest received, making £34,263. After providing for administration expenses, debenture interest, &c., there is a net profit of £764 (against a net loss of £9,317). The 8 per cent. prior lien debenture stock was due for redemption on July 1st last, but with the consent of stockholders, the redemption date has been postponed for five years to July 1st, 1936.

Companies Struck Off the Register.—The names of the undermentioned companies have been struck off the Register and they are thereby dissolved:—

Electrical Automatics, Ltd.
Insulated Wires, Ltd.
Lattin Electrical Products, Ltd.
Perfection Loud Speaker Wireless Co., Ltd.
Regal Radio Co., Ltd.
Syrophone Radio Co., Ltd.

Yarrow & Co., Ltd., report a profit for the year ended June 30th last of £16,211, as compared with £9,896 in the preceding year. The dividend is maintained at 5 per cent. and the carry-forward is increased from £9,670 to £18,382. The report states that the various departments have been fairly busy throughout the year, especially the boiler department, in which a large number of boilers for both land and marine installations have been constructed. Meeting: December 21st.

The United Electric Tramways Co. of Caracas reports a net profit of £3,147, for the year ended June 30th, as compared with £7,379 in the preceding year, to which is added £61,077 brought in, making £64,223. The directors recommend that, owing to the loss on the working of the omnibuses, this amount shall be carried forward.

The Manx Electric Railway Co., Ltd., reports gross receipts for the year ended September 30th of £29,318, as compared with £35,345 in the preceding year, and gross expenditure of £26,431, as against £30,777, leaving £2,887 (£4,568), from which is deducted debit balance brought forward (£208) and debenture interest (£3,235), leaving an adverse balance of £5,555 to be carried forward.

The London Electric Supply Corporation, Ltd., announces that an extraordinary general meeting of shareholders will be held on December 16th to consider, and if thought fit to pass, a resolution authorising the creation of 150,000 new ordinary shares of £1 each ranking *pari passu* with the existing ordinary shares.

The General Electric Co. (U.S.A.) has declared the regular quarterly dividend of 40 cents per share on the common stock.

The Allgemeine Elektricitäts-Gesellschaft (A.E.G.) reports that the turnover for the year ended September 30th last was Rm. 370,000,000, a reduction of 30 per cent. as compared with the preceding year. The company states that orders also have fallen off, but its financial position is satisfactory.

The Fort William Electric Lighting Co., Ltd., reports a profit of £556 for the past year, to which is added a balance of £168 brought forward, making £724. The directors propose to pay a dividend of 6 per cent. on the ordinary shares and to carry forward £184.

Radiovisor Parent, Ltd., reports a loss of £25,218 for the year ended August 31st last, increasing the debit balance to £43,660. The directors state that the difficulties of developing a new industry had been considerably increased by the world-wide trade depression. Meeting: December 16th.

The Electric and General Investment Co., Ltd., has decided to pay no interim dividend on its ordinary shares in respect of the year ending May 31st next.

The Radio Corporation of America has passed the dividend of $1¼ on the preferred "B" stock, but is to pay the regular quarterly dividend of 87½ cents on the preferred "A" stock.

The East African Power and Lighting Co. has declared an interim dividend of 3 per cent., less tax, on the ordinary shares.

E. K. Cole, Ltd., report that their last week's issue of preference and ordinary shares was over-subscribed.

Stocks and Shares

TUESDAY EVENING.

IN one way, it may be said that the feature of the Stock Exchange markets is a lack of business, but as the latter has become such a common condition, it hardly deserves to be distinguished as a feature. The weakness of sterling, the nervousness felt in regard to the finances of Germany, and the near approach of the January income-tax payment, are three of the principal factors which overhang the Stock Exchange markets at the present time. The Government's policy in regard to tariffs is moving a little too slowly to satisfy the more ardent spirits that have been looking forward to immediate protection being applied to iron and steel, as well as to those articles already dealt with under the Abnormal Importations (Customs Duties) Act. Dollar stocks of most descriptions have benefited from the decrease in the value of the £ sterling.

Home Railway Stocks

Amongst the home issues which show improvement on the week, Underground Electric ordinary shares stand out with a rise of 1s. to £1. A little buying has been encouraged by rumours, extremely vague at present, with reference to the probable outcome of the London Passenger Transport Bill. This had no strengthening effect upon other stocks in the Home Railway market, and Districts remain at 61½, Metropolitans at 38¼ are a point down. The Government, it is recognised, has had its hands full of other matters which may be regarded as more important than London transport, but it is thought that early in the new session which begins next February, serious attention will be devoted to the London Passenger Transport Bill, in view of the existence of problems which grow more persistent with every month that passes.

Foreign Traction

Mention was made last week of the adjournment of the meeting held on November 30th last, of the Anglo-Argentine Tramways 5 per cent. debenture stockholders, a quorum not having been present. It was resolved to hold the meeting on Tuesday in next week, December 15th, and amendments have been prepared to the scheme that will be submitted at the coming meeting. The amendments refer to the moratorium which is proposed in respect of interest. The proposals have had no effect upon the prices of the shares or the stock, the two preferences remaining at 6s. 3d., and the 5 per cent. debenture stock at 12½. Other Argentine traction issues are still very depressed. Brazilian Tractions have gone back a trifle to 14. Mexican Tramways 5 per cent. bonds show a gain of $3 at 30½. Rumours are current to the effect that affairs in Mexico are moving towards improvement, and these are directing a little speculative attention to Mexican issues generally.

Home Electricity Shares

The Newcastle-on-Tyne Electric Supply Company seeks power to change its name to the North-Eastern Electric Supply Company. Under a comprehensive scheme put forward by the Newcastle-on-Tyne Electric Supply Co., it is proposed that the undertakings of seven other electrical companies shall be transferred to the former company as from September 13th next year. Consideration is to be satisfied partly by exchange of shares, partly by payment in cash. The Newcastle Company already holds the entire share capital of some of the companies embraced by the scheme, and it holds control, through associated companies, of various others. There is, of course, nothing new in the proposal, the chairman having mentioned the suggested amalgamation at the annual meeting held nine months ago, and no changes have occurred in the prices of any of the shares. The debenture stocks of the Central Electricity Board and of the London and Home Counties J.E.A. have been lowered to 86 xd. and 87½ respectively, in sympathy with the decline in fixed-interest stocks of most descriptions. The London Electric Supply Corporation has called a meeting to be held on Wednesday of next week to pass a resolution increasing the capital by 150,000 ordinary shares of £1 each, ranking *pari passu* with the existing ordinary shares. The

price of London Electrics is 6d. up at 33s. on hopes of an issue upon bonus terms. The company's dividend for 1930 was 9 per cent., and 8½ per cent. in the previous year.

Ekco

The offer of preference and ordinary shares in E. K. Cole (Ekco) proved very successful. It is stated that something like 2,500 separate applications for shares were received, and in the allotment most of the public applicants received approximately a third of the amount applied for. Dealings started in the shares on Monday in this week, and the price of the preference is now 2s. 6d. discount; that of the ordinary being 6s. 3d. premium. The provision whereby applicants for ordinary shares had to apply at the same time for preference shares—applications for ordinary shares alone not being considered—aroused mild criticism. The ordinary had to be paid for on allotment; the preference will become fully paid on the 4th of next month. There were 140,000 of each kind offered, the preference being of £1, the ordinary 5s.

Manufacturing Companies

General Electrics have recovered to 42s. 6d., being 1s. 9d. up on the week, and Associated Electrical Industries rose 6d. to 21s. 3d. The latter company's offer of new ordinary shares of £1 each at a guinea a share had to be sent in, if it was accepted, on or before the Thursday in this week. When the offer was made at the end of September, a small premium obtained, and at the head of the allotment letter of the new ordinary shares there is printed in red: "This document is valuable; do not destroy it." The premium ran off, of course, as the price of the old shares fell to the same as that at which the new are being offered, but it is probable that a proportion of shareholders will take up their new shares, on the strength of their faith in the company's prospects. The old shares carry about 1s. more dividend at their present price.

Johnson & Phillips are a dull market at 25s., showing a fall of a florin, and Siemens have gone back to 22s. 6d. British Insulated at 2½ are ⅛ down. The Indiarubber, Gutta Percha and Telegraph Works Company shows a net loss for the thirteen months ended September 30th last of £51,592, which is £44,000 less loss than that shown by the figures in the previous year. The debit balance now comes to £123,755, which is carried forward. The preference dividend due next New Year's Day will not be paid, and it may be remembered that the dividend due on July 1st last was also passed. The report suggests that the improvement indicated in the accounts is the result of the reorganisation commenced towards the end of the previous financial year. Ever-Ready shares are an active market at 21s. 9d., and, according to well-informed report, the company is doing well.

Tokyo Electric Premium

Tokyo Electric Light 6 per cent. first mortgage bonds have risen to 94, on the company's announcement that the coupon due on December 15th can be received by bondholders in sterling calculated on the sight rate of exchange on New York ruling on the day when the coupon is presented. If the sight rate on New York should be 3.40 dollars to the £, a holder of £100 bond would be entitled to receive £4 5s. 11d. per cent. less tax in respect of his £3 coupon. If the dollar is 3.10, the coupon would be worth £4 14s. 2d., less tax. This is a very practical illustration of the advantage which occasionally the British holder of stocks and shares will receive by reason of the fall in the value of sterling.

Cables and Wireless

Prices in the Cables & Wireless group continue weak, the 5½ per cent. preference stock losing 3 points at 49½, while the "A" ordinary at 18½ is 1 down. American Telephone & Telegraph, by reason of the movements in the sterling rate, have risen to 200. Internationals are unaltered at 18. Rio Tramway firsts retain their gain at 107½, but the company's 5 per cent. mortgage bonds at 71½ are 2 points easier. Globe Telegraph & Trust preference shares have fallen 1 to 8, in consequence of the passing of the quarterly dividend on the company's ordinary shares. The price of the latter is unchanged at 9. Anglo-American preferred has gone back to 93, and the company's ordinary stock is lower at 60. Marconi Marines went back to 33s. 9d.

Miscellaneous Matters

The political position which has developed in regard to the proposed tariff on iron and steel is responsible for irregularity in the prices of shares of companies connected with the industry. Babcock & Wilcox are steady at 48s. 9d. Vickers at 8s. 3d. are a shade easier than they were. Business in this section, which was remarkably lively three or four weeks ago, has subsided to a low ebb, though it is not so bad as the situation in the rubber share market. Dutch representatives of the rubber industry landed in this country at the end of last week, and are discussing afresh with the Colonial Office the advisability of a restriction policy. It must be admitted that there is not a great deal of hope in London of any substantial benefit being secured for the rubber industry as a result of the present *pourparlers*.

Victoria Falls Power is paying off £94,600 of its 5½ per cent. second mortgage debentures, on January 1st next, at 103. The bonds are quoted in the market at 105½, with a coupon due on January 1st. The 5 per cent. first mortgage debenture stands at 110. Interest on both these debentures is paid free of income tax.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Dec. 8, 1931.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole		15	15	57/6	—	5 4 4
Brompton Ordinary		8½	8½	27/6	-	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	86xd	-1½	5 4 8
Charing Cross Ordinary	1	8½	8½	29/-	—	4 16 7
Chelsea	1	8½	8½	28/-	—	5 7 8
City of London	1	10	10	35/-	—	5 14 3
Clyde Valley	1	8	8	31/3	—	5 2 5
County of London	1	11	11	43/9	—	5 0 7
Edmundsons' 7% Pref.	1	7	7	23/6	- 1/.	5 19 2
Elec. Supply Corporation	1	11	11	41/3	—	5 6 6
Kensington Ordinary	1	8	8	29/-	—	4 16 7
Lancs. Light and Power	1	7	6½	25/-	—	5 4 0
London & Home Counties 4½% Deb.	Stock	—	—	87½	-1½	5 2 10
London Electric	1	8½	9	33/-	+6d.	5 6 1
Metropolitan	1	9	10	38/9	—	5 3 3
Midland Counties	1	6½	7	27/0	—	5 3 8
Mid. Elec. Power	1	15	8	29/6	—	5 8 6
Newcastle-on-Tyne Ordinary	1	6	6	23/9	-	5 1 1
Do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	29/-	—	4 16 7
Scottish Power	1	8	8	28/3	—	5 13 3
South London	1	8½	8½	25/6	—	5 9 8
Urban Ordinary	1	7	7	27/-	—	5 3 8
Westminster Ordinary	1	8½	8½	28/-	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/-	—	6 10 5
Yorkshire Elec.	1	8	8	32/-	—	5 0 0
HOME RAILS						
Central London Ord. Assented	Stock	4	4	70½	—	5 13 6
Metropolitan	,,	4	3½	38½	—1	9 1 10
Do. District	,,	5	5	61½	—	8 2 8
Underground Electric	1	8	8	1	+1/-	7 16 1
TELEGRAPHS AND TELEPHONES						
Anglo-Am. Tel. Pref.	Stock	6	6	93	—2	6 9 0
Do. Def.	,,	1½	1½	23	—	6 10 5
Cables & Wireless 5½% Pref.	Stock	5½	5½	51½	—3	—
Do. A 7½% Ord.	,,	Nil	—	18½	—1	—
Do. B Ord.	,,	Nil	—	11	—	—
Globe Tel. and T. Ord.	10	10	8½	9	—	—
Do. do. Pref.	10	6	6	8	—1	7 10 0
Great Northern Tel.	10	20	20	22½	—	8 17 10
Marconi-Marine	1	15	15	33/9	⅛	8 17 5
Oriental Telephone Ord.	1	12	12	2½	—	*5 13 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	12½	—	—
British Electric Traction Def. Ord.	,,	5	5	750	—100	—
Do. do. Pref. Ord.	,,	8	8	119xd	—	6 14 6
Brazil Traction	100	8	—	14	—½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89	- 1½	5 12 4
London & Sub. Trac. 5% Pref.	1	Nil	Nil	9/3	—	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 3
Mexico Trams, 5% Bonds	—	5	5	30½	+3	16 8 0
Mexican Light Common	100	Nil	Nil	25	—	—
Do. 7% Pref.	100	7	7	35	—	20 0 0
Do. 1st Bonds	—	5	5	62	—	8 1 4
Victoria Falls Ord.	1	15	15	57/6	—	5 4 4
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—
MANUFACTURING COMPANIES						
Assoc. Elec. Ord.	1	6	6	21/3	+6d.	5 12 11
Do. Pref.	1	8	8	27/6	—	5 16 5
Babcock & Wilcox	1	15	14	48/9	—	*5 14 10
British Aluminium Ord.	1	10	10	26/3	—	7 12 5
British Insulated Ord.	1	15	15	2½	- ⅛	5 4 4
Brush Ord.	Stock	10	5	70	-	7 2 10
Callender's	1	15	15	2½	—	5 9 1
Do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/-	30	30	22/6	—	6 13 4
Do. 8% Pref.	1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 6
Do. 5% Deb.	Stock	5	5	91½	—	5 9 3
Electric Construction	1	5	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	4¼	—	6 3 1
English Electric	1	Nil	Nil	10/-	—	—
Do. do. Pref.	1	Nil	Nil	8/9	—	—
Ferranti Pref.	1	7	7	21/3	—	6 11 9
G.E.C. Pref.	1	6½	6½	24/-	—6d.	5 8 4
Do. Ord.	1	14	10	42/6	+1/9	4 14 2
Henley's	1	30	30	5⅛	—⅛	5 15 3
Do. 4½% Pref.	5	4½	4½	4	—	5 12 6
India-Rubber	1	Nil	Nil	6/3	—	—
Johnson & Phillips	1	10	10	25/-	- 2/-	8 0 0
Siemens Ord.	1	7½	7½	22/6	- 9d.	6 13 4
Telegraph Construction	12	10	7½	13	—	6 18 6

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930.

17,431. "Luminescent gas-discharge tubes." Claude Neon Lights Inc. June 26th, 1929. (360,823.)
20,446. "Induction furnaces." A. Carpmael (Ugine-Infra). July 5th, 1930. (360,827.)
20,886. "Loading-structure for an electric signalling conductor." Standard Telephones & Cables, Ltd., R. L. Hughes, and E. Baguley. July 10th, 1930. (360,933.)
20,948. "High-potential transformers." Koch & Sterzel Akt.-Ges. July 27th, 1929. (360,935.)
21,062. "Overload thermally operating circuit-breakers." International General Electric Co., Inc. July 11th, 1929. (360,843.)
21,564. "Electric illumination control systems." British Thomson-Houston Co., Ltd. July 19th, 1929. (360,939.)
23,216. "Electric frequency control systems." Standard Telephones & Cables, Ltd. (A. H. Reeves). August 1st, 1930. (360,891.)
23,575. "Television systems." Communication Patents Inc. May 5th, 1930. (360,941.)
23,593. "Electrical insulating-materials." International General Electric Co., Inc. August 7th, 1929. (360,848.)
23,608. "Television and like apparatus." J. L. Baird and Television, Ltd. (In liquidation.) August 6th, 1930. (Cognate application 11354/31.) (360,942.)
23,652. "Telegraph systems." M. B. Kerr and International Communications Laboratories Inc. August 7th, 1930. (360,913.)
23,707. "Television." Communication Patents Inc. May 31st, 1930. (360,850.)
23,782. "Enclosed dynamo-electric machines." General Electric Co., Ltd., and W. M. Cranston. August 8th, 1930. (360,915.)
23,977. "Electro-magnet or transformer with hollow and slotted core." A. Schutz. August 11th, 1930. (360,952.)
23,980. "Device for adjusting the contact period in electromagnetic clock-winding devices." A. E. Schlenker. August 11th, 1930. (360,857.)
24,004. "Electric relay mechanism." Westinghouse Brake & Saxby Signal Co., Ltd. August 14th, 1929. (360,953.)
24,171. "Electric water-heaters." H. H. Berry and C. A. Painton. August 12th, 1930. (360,959.)
24,172. "Rectifiers for alternating electric currents." R. J. Elsome-Jones. August 12th, 1930. (360,960.)
24,261. "Electric negative resistances." E. Habann. August 15th, 1929. (360,920.)
24,268. "Electric cables." Western Electric Co., Ltd. (O. E. Buckley). August 13th, 1930. (360,921.)
24,476. "Electric upsetting apparatus." G. Benedetto. August 15th, 1930. (360,974.)
24,487. "Combined mechanically and electro-magnetically operated valve." J. L. Musgrave and R. Crittall & Co., Ltd. August 15th, 1930. (360,978.)
24,502. "Electric signalling systems." Automatic Telephone Manufacturing Co., Ltd. September 14th, 1929. (360,979.)
24,601. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and G. T. Baker. August 16th, 1930. (360,983.)
24,838. "Submarine electric cables." Western Electric Co., Ltd. (J. J. Gilbert). August 19th, 1930. (360,996.)
24,844. Telephone systems." Automatic Telephone Manufacturing Co., Ltd., C. Gillings, and F. T. Belas. August 19th, 1930. (360,997.)
24,945. "Instrument control elements." British Thomson-Houston Co., Ltd. August 20th, 1929. (361,001.)
25,901. "Electric testing appliances. E. L. Lee and W. C. Taylor. August 29th, 1930. (361,013.)
26,026. "Control or protective apparatus for use with electric circuit-interrupters." G. R. Shepherd (Westinghouse Electric & Manufacturing Co.). September 1st, 1930. (361,016.)
26,201. "Submarine telephone cables." Siemens-Schuckertwerke Akt.-Ges. December 6th, 1929. (361,021.)
27,396. "Arrangements for connecting electric cables." British Insulated Cables, Ltd., and R. W. Blades. September 13th, 1930. (361,039.)
27,564. "Electrical connection." E. E. Atwood. September 15th, 1930. (361,044.)
29,629. "Thermionic valve holders." Junit Manufacturing Co., Ltd., and D. C. Beer. October 3rd, 1930. (361,056.)
30,200. "Electric stove for heating and ventilating." I. Eckmann. October 9th, 1930. (361,063.)
31,401. "Control of selecting switches such as used in automatic telephone systems." Siemens Bros. and Co., Ltd., and W. G. Patterson. October 20th, 1930. (361,071.)
31,596. "Apparatus for measuring short time intervals." Submarine Signal Co. December 13th, 1929. (361,075.)
31,635. "Driving means for loud-speakers." H. Van Dam, and D. H. Van Dam. October 22nd, 1929. (361,076.)
31,841. "Testing methods in telephone exchanges." Coventry Automatic Telephones, Ltd., and A. A. Chubb. October 23rd, 1930. (361,079.)
31,902. "Insulators." British Thomson-Houston Co., Ltd. October 24th, 1929. (361,080.)
33,649. "Connecting or coupling devices for multicore electric cables." G. R. Mason and Associated Electrical Industries, Ltd. November 8th, 1930. (361,099.)
34,021. "Quick make-and-break electric switches." Revo Electric Co., Ltd., and F. H. Reeves. November 12th, 1930. (361,106.)
34,089. "Electric motor speed regulating systems." British Thomson-Houston Co., Ltd. November 12th, 1929. (361,107.)
35,113. "Telegraph perforators." Imperial and International Communications, Ltd., H. V. Higgit, and F. Warburton. November 21st, 1930. (361,116.)
35,181. "Photo-electric cells." Gramophone Co., Ltd., W. F. Tedham, and G. B. Baker. November 21st. 1930. (361,118.)
35,196. "Dynamo-electric machines." R. Bosch Akt.-Ges. December 9th, 1929. (361,119.)
35,729. "Electrically driven machines for milling metals." L. Renault. March 5th, 1930. (361,125.)
36,169. "Electron devices." Arcturus Radio Tube Co. December 17th, 1929. (361,130.)
36,199. "Electrical interlocking of flameproof switches with plug-and-socket fittings." Siemens-Schuckertwerke Akt.-Ges. March 11th, 1930. (361,131.)
36,223. "Electric hot-water apparatus." P. Gilmour. December 14th, 1929. (361,132.)
36,746. "Electric sound transmission systems." H. B. Rantzen. December 5th, 1930. (361,144.)
38,153. "Supports for electric heating-elements." G. Bray and Co., Ltd., and G. Bray. December 18th, 1930. (361,159.)
38,190. "Plugs for electric switches." G. Marr. December 18th, 1930. (361,160.)
38,887. "Electrodes for electric accumulators having alkaline electrolytes." J. Y. Johnson (I.G. Farbenindustrie Akt.-Ges.). December 24th, 1930. (361,164.)
39,164. "Electric discharge tubes." Egyesult Izzolampa Es Villamossagi Reszvenytarsasag. October 7th, 1930. (361,170.)

1931.

826. "X-ray tubes." (Westinghouse Lamp Co.) January 9th, 1930. (361,179.)
1,062. "Method of localising leakages in ducts provided in high-voltage cables for the reception of a fluid under pressure." Naamlooze Vennootschap Handeimaatschappij Cablon. (Cablon Corpn.) April 11th, 1930. (361,183.)
1,298. "Cathodes for thermionic valves." M-O Valve Co., Ltd., and J. H. Phillips. January 14th, 1931. (361,184.)
1,772. "Protective apparatus for electric supply networks." Siemens-Schuckertwerke Akt.-Ges. February 25th, 1930. (361,185.)
2,203. "Electric heating resistances." Electroterm Akt.-Ges. January 22nd, 1930. (Addition to 287,458.) (361,188.)
3,062. "Protective devices for electric circuits." British Thomson-Houston Co., Ltd. January 30th, 1930. (361,193.)
3,385. "Electric coils." R. Bosch Akt.-Ges. March 13th, 1930. (361,196.)
3,447. "Means for regulating the speed of electric motors in relation to that of a master machine." Allmanna Svenska Elektriska Aktiebolaget. February 7th, 1930. (361,199.)
4,097. "Covering tiles for electric cable conduits and the like." J. Procter and Sutton Oak Brick Co., Ltd. February 10th, 1931. (361,208.)
7,439. "Electrically wound clocks." Junghans Akt.-Ges. Geb. July 11th, 1930. (361,232.)
9,408. "Spring rings for electrical insulators." Hermsdorf-Schomburg-Isolatoren Ges. March 29th, 1930. (361,243.)
12,894. "Traffic-control systems." H. A. Gill (Automatic Signal Corporation). April 30th, 1930. (Divided application on 13308/30.) (360,924.)
12,908. "X-ray tubes." C. H. F. Muller Akt.-Ges. May 22nd, 1930. (361,260.)
29,261. "Electric controller systems for printing presses." A. J. Cline. May 9th, 1930. (Divided application on 14339/30.) (360,837.)

Universal metal couch and control desk shown by Newton & Wright at the Radiological Exhibition. (*See pp.* 871-3.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Any objections against any of the proposed marks may be entered within one month from December 2:—

Yunos. No. 523,943. Class 8. Electric batteries (not for medical purposes), ammeters and electric cable. No. 523,944. Class 13. Metal goods.—B. Sacov, trading as the Universal Electric Lamp Co., 89, Great Eastern Street, E.C.2.

Igranovox. No. 526,650. Class 8. Radio-telegraphic and telephonic instruments and apparatus and parts thereof.—Igranic Electric Co., Ltd., 147, Queen Victoria Street, E.C.4.

Carboray, No. 526,772, and Silicaray, No. 526,773. Class 18. Electric fires.—British Resistor Co., Ltd., Trafford Park Road, Old Trafford, Manchester.

New Italian Companies

Among the new companies recently formed in Italy are the Società Idroelettrica Alta Modenese, S.I.A.M., organised at Pievepelago to prepare plans for the establishment of hydro-electric stations in the Alto Modenese area; La Società Tiberina di Elettricita, Rome; La Società Costruzioni Apparecchi Radio ed Elettrici John Gelosa, Milan; and La Società Elettro Frigo-Boiler, Milan.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Hall (8,000 seats), Kittybrewster, for the Palais de Danse (Aberdeen), Ltd.; the manager.

Ashton-under-Lyne.—School, Smallshaw, for the borough E.C.; director of education.

Batley (YORKS).—Bazaar premises, Commercial Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

Bedford.—Extensions, girls' training school, Park Road North; W. B. Stonebridge Harris, architect, 26, St. John Street.

Beeston (NOTTS).—Bank, High Road; F. R. C. Palmer, architect, National Provincial Bank, Ltd., 15, Bishopsgate, E.C.2.

Berwick-upon-Tweed.—Conversion of Newlands Hotel into telephone exchange; H.M. Office of Works, King Charles Street, London, S.W.1.

Bexhill-on-Sea.—Houses, Cambridge Road; J. H. Lye, Chepbourne Road.

Billingham (DURHAM).—Schools; rector, Catholic church.

Bilston (STAFFS).—Houses (176), Lunt Gardens, for the U.D.C.; surveyor. Works extensions, Loxdale estate, Advance Foundry Co.

Birkenhead.—Bank, Old Chester Road and Grove Road; H. C. Killinder. Library; Gray, Evans & Crossley, architects, 51, North John Street, Liverpool.

Birmingham.—Reconstruction of Kent Road baths (£59,897); Parsons & Morrin. Alterations, Metallurgical Dept., Central Technical College (£2,800). Reconstruction of main block, Selby Oak Infirmary (£12,000); and extensions to Dolphin Lane and Paget Road Schools; city architect.

Blackburn.—Houses (376), Longshaw; Lloyd & Cross, Ltd., builders, 57, Hamilton Square, Birkenhead.

Blackpool.—Houses (74), Highfield Road; borough engineer. Church, Marton; secretary, Fylde Congregational Church Council.

Bolton.—Houses and shops, Cameron Street; borough engineer. Alterations to Empire Cinema, Howard Street; Empire Picture Co., Ltd. Catholic school (400 places), St. Ethelberts; Rev. T. McGrath.

Bradford.—Alterations to Victoria Palace Picture Theatre, Girlington; licensee.

Bristol.—Baths, Shirehampton (£25,289); F. Wilkins. Development of Bedminster estate; W. Ash & Sons, builders.

Bury.—Housing scheme, Brandlesholme Road: borough surveyor.

Cambridge.—University library; Sir G. G. Scott, architect, 7, Gray's Inn Square, London, W.C. General post office, St. Andrew's Street, for H.M. Office of Works, King Charles Street, London, S.W.1.

Carlisle.—Houses (230), for the T.C.; P. Dalton, surveyor, Town Hall.

Crouch End.—Shops and flats, Crouch End Hill; Copus Motors, Ltd., 30, Crouch End Hill.

Dewsbury.—Technical college extensions (£19,000), for the borough E.C.; director of education.

Doncaster.—Houses (250), Intake; Corporation housing surveyor. Workshops, &c., at new highway depôt, Marsh Gate; F. O. Kirby, borough engineer, 2, Priory Place.

Eastbourne.—Cinema, Devonshire Place and Cornfield Road; Verity & Beverley, architects. Alterations to Hydro Hotel, Mount Road; G. Bainbridge & Sons, builders. Workshops for the Red Cross Society, Upperton Road; F. G. Cooke, architect. Additions to Eastbourne College, Carlisle Road; Tatchell and Wilson, architects.

Edinburgh.—Extensions to Gogarburn Institution (£17,000) and nurses' home, Bangour (£21,000); city architect. Primary school and new technical department at George Heriots School (electrical work); Reid & Forbes, architect, 17, Great Stuart Street.

Essex.—School, Eastbrook End, Dagenham (£35,359); V. G. Selwood, builder, Chelmsford.

Felling-on-Tyne.—Public libraries, Felling and Pelaw; G. W. Hall, architect, Council Offices.

Fort William.—Alterations to post office; H.M. Office of Works, Storey's Gate, S.W.1.

Garstang (LANCS).—Houses (88), for the R.D.C.; surveyor.

Gateshead.—Houses (36), Low Fell; Kirk & Dickinson, builders, Low Fell.

Godalming (SURREY).—Houses (50), for the T.C.; H. Ashenden, builder, Guildford.

Hampton (MIDDLESEX).—Pumping station buildings, for the M.W.B. (£5,258); Grace & Marsh, Ltd.

Hertfordshire.—Extensions, including nurses' home and nursery block, Haymeads Institution, Bishop Stortford, for the county P.A.C.; J. M. Sheppard, architect, 38, Bedford Place London, W.C.

Hounslow (MIDDLESEX).—Telephone exchange; H.M. Office of Works, King Charles Street, S.W.1.

Hull.—Grammar school, Bricknall Avenue, for the City E.C.; director of education.

Irish Free State (CORK).—City hall and municipal offices, Albert Quay; Jones & Kelly, architects, 17, South Frederick Street, Dublin. (DUBLIN).—Rebuilding of the National Maternity Hospital, Hollis Street; W. H. Byrne & Son, architects, 20. Suffolk Street.

Kingston-on-Thames.—Cinema theatre, High Street, for Cinema Services, Ltd., Birmingham.

Leeds.—Houses and flats, Middleton and Torre housing estates; J. E. Acfield, city engineer, Municipal Buildings. Estate development, Henconner Lane and Methley Grove; Newson & Gott, architects.

Lincoln.—Houses (82), St. Giles, for the T.C.; city surveyor. Extensions, Skellingthorpe Road and St. Giles' schools (£24,750), for the E.C.; director of education.

Liverpool.—Cancer hospital (£70,000); Alderman H. M. Miller, chairman. Copplehouse Hotel, Longmoor Lane, Kirkby (£14,187); Murray & Fowler, builders and contractors, Gerald Street.

Llwyncelyn, Aberayron (CARD).—Installation of electric lighting plant, Llwyncelyn Chapel; J. O. Evans, secretary.

London (STEPNEY).—Housing scheme, Three Colt Street; borough engineer.

Luton (BEDS).—Extensions, *Luton News* offices, for Gibbs, Bamforth & Co.; W. H. G. Hubbard, architect.

Manchester.—Houses, Seymour estate; city architect.

Mansfield.—School (400 places), Carr Bank, for the E.C.

Martock (SOMERSET).—Factory for Nestlé's Anglo-Swiss Condensed Milk Co., Ltd.

Middlesbrough.—Reconstruction of Fleetham Street School (£24,000); director of education.

Newburn (NORTHUMBERLAND).—Houses (87), East of the Chapel estate; F. W. Hindmarsh, builder, Fawdon Lane, Gosforth.

Newbury (BERKS).—School (400 places), Speenhamland, for the borough E.C.; director of education.

Newcastle-on-Tyne.—Houses for the Tyne, Tees Shipping Co., Ltd.; Marshall & Tweedy, architects, 129, Pilgrim Street. Branch premises, Northumberland Street, for Woodhouse & Sons; North, Robin & Wilsdon, architect, Greycoat Place, S.W.1. Alterations to the Duke of Argyle Hotel; J. T. Shevill, builder, 43, Hawthorn Street. Alterations to the Fox and Hounds Hotel; Mauchlen & Weightman, architects, 1, Collingwood Street. Rebuilding of Grey Nags Hotel for R. Deuchar & Co.; J. W. Thompson, 20, Bigg Market. Extensive alterations to the Market Lane Hotel; J. W. Taylor, St. John Street.

Newport (I.O.W.).—Factory, Blackhouse; J. H. Slater. Stores, joinery works, &c., Trafalgar Road; F. Chiverton, architect.

Northampton.—Houses (241), Kettering Road estate (£79,950); Harris Bros., builders, Derby. Estate development, Kettering Road and Buttocks Booth Lane; H. Martin, Ltd. Extensions to Congregational School, Abington Avenue; trustees.

Northern Ireland (BELFAST).—Rebuilding of the Congregational Church, Donegall Street; J. Seeds, architect, 7, Donegall Square West.

Otley (YORKS).—Extensions to premises of Dawson, Payne & Elliott, Ltd.; O. Holmes, architect, Borogate.

Plymouth.—Housing scheme and maternity centre, St. Aubyn Street; borough engineer. Laundry for hospitals (£6,100); A. N. Coles (Contractors), Ltd.

Reading.—Houses (266), Cressingham Road, and additions to Woodley Institution; borough surveyor.

Repton (DERBYSHIRE).—Conversion of "The Poplars" into public offices for the R.D.C.; West & Sons, builders. Houses, Hilton and Walton-on-Trent, for the R.D.C.; R. S. Litherland, architect.

Richmond (YORKS).—Post Office; H.M. Office of Works, King Charles Street, S.W.1.

Ringmer (SUSSEX).—Theatre, Glyndebourne House, for J. Christie.

Ripon.—Omnibus depôt for the United Automobile Co.; J. H. Coldbeck, builders.

Rotherham.—Cinema, with café, for Regal Cinemas, Ltd.; H. Buxton, chairman. Shops, Herringthorpe estate; J. W. Bailey.

Rugby.—Co-operative stores, Southfields estate; F. Hollowell, builder, Clifton Road.

Salford.—Town hall extensions and housing scheme, Wheater's Field, for the T.C.; borough surveyor. Exhibition hall, &c., cattle market site (£250,000), for the Central Midland Trust, Ltd.; R. Atkinson, architect.

Scarborough.—Shops, offices, &c. (£63,951), for the T.C.; borough surveyor. School, Hinderwell, for the T.C. (£23,000); H. W. Smith, engineer, Town Hall. Conversion of Grand Opera House into cinema, for O. Gray; F. Tugwell, architect, 102, Westborough. Extensions, including maternity block, Scalby Road Hospital, for the Hospital Board; clerk.

Seaham Harbour.—Housing scheme, Deneside estate; U.D.C. surveyor.

Sedgefield (DURHAM).—Houses (600); W. P. Plews, surveyor, R.D.C. Offices.

Smethwick.—Block of firemen's flats, Rolfe Street; R. Fletcher, borough engineer, Council House.

Southsea.—Extensive alterations, 198, Albert Road, for A. W. Lord.

Stockport.—Sewage works laboratory for the T.C.; W. F. Gardner, borough surveyor.

Sutton and Cheam.—Houses (100), Worcester Park, for the U.D.C.; surveyor. Pumping station, for the Water Co.; secretary.

Torquay.—Cinema, Castle Circus; Associated British Cinemas, Ltd. Ice rink, Babbacombe Road; G. W. Hands, Palace Hotel. Shops, &c., Barton Road and Hele Road; Torquay Co-operative Society, Ltd.

Tunbridge Wells.—Houses (110), Grange Farm estate, for the T.C.; borough surveyor.

Ulverston.—Factory, Rink Hall estate; G. Moss & Sons, Ltd., builders, St. Helen's Street, Leigh.

Urmston.—Public baths, Princess Road, Flixton; E. L. Leeming, architect, Council Offices, Green Lane, Patricroft, Manchester.

Wallsend-on-Tyne.—Houses (60); J. Blench, engineer, Town Hall.

Warwick.—Works, Packmores estate, for Kingston Carburettors, Ltd.

Warwickshire.—School, Wyken (£12,151), for the county E.C.; Bosworth & Wakeford, Ltd., builders. Extensions, county mental hospital and nurses' home (£76,000), for the C.C.; county architect, Leamington Spa.

Weetslade (NORTHUMBERLAND).—Houses (100), Weetslade; H. G. McNaught, U.D.C. surveyor.

Wheathampstead (HERTS).—Senior church schools for the managers; vicar.

Witney (OXON).—Blanket factory, for Wormalds & Walker, Ltd., Dewsbury.

Worcester.—Postal sorting office (£10,000); H.M. Office of Works, King Charles Street, London, S.W.

York.—Houses (108), Huntington Road; city engineer.